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VOL. CLIII, No. 2 FEBRUARY, 1917 No. 539

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FEBRUARY, 1917

ORIGINAL ARTICLES

EPIDEMIC POLIOMYELITIS: ITS NATURE AND MODE OF INFECTION.[1]

By Simon Flexner, M.D.,

NEW YORK.

The present time, while we are under the influence of the serious epidemic of the past summer and autumn, may be the most favorable time to impress certain essential facts regarding poliomyelitis upon the general medical profession.

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[1] Part of the discussion on Poliomyelitis held at the College of Physicians of Philadelphia, December 6, 1916.

outbreak in Sweden of 1905. It was the epidemic of 1905 which was the immediate forerunner of the pandemical occurrences mentioned.

Unfortunately, very considerable uncertainty exists still regarding the character and nature of this epidemic disease. Because of its recent introduction into this country a large part of the medical profession has lacked familiarity with it. On the surface it is not so easy to identify the severe forms of the epidemic disease with the occasional and sporadic instance of infantile paralysis arising in every considerable community, and yet essentially they are one and the same disease—that is, they are due to a common etiological agent, in the same manner as the sporadic instances and epidemics of cerebrospinal meningitis are both caused by the meningococcus.

Considerable difficulty and confusion have been introduced into the subject by the common names for the epidemic disease. As is usual, names express conceptions, and in this case the names chance to be misapplied. So long as the disease is conceived of as one attended by paralysis, which in turn is due to lesions of the gray matter of the spinal cord (or brain), a large number of cases are excluded altogether. Because we have now learned, thanks especially to Wickman, who studied the Swedish epidemic of 1905, that many cases of the disease, perhaps the majority, in epidemic times are not associated with any paralysis whatever. I shall not elaborate this point; I introduce it merely to emphasize its importance in respect to the public health control of the disease. Others who follow will doubtless refer to this same point. But I wish to leave you under no doubt that the disease we are considering appears in a variety of clinical forms, some of which are very slight and trifling and others of the profoundest severity.

If I should be called on to define epidemic poliomyelitis—so-called—I should call it an acute infectious and communicable disease, attended sometimes, but by no means always, with involvement of the central nervous organs, as a result of which incident paralysis often results. The parts of the central nervous organs most frequently involved are the meninges, with which may be and often is associated injury to the gray matter of the spinal cord and brain leading to muscular paralysis.

In its essential nature the disease is an infection. We now know, thanks especially to the employment of monkeys for inoculation, that the microörganism causing it is very minute, filterable, indeed, but probably not invisible. That is, by particular cultivation methods a minute anaërobic microörganism has been secured which fulfils Koch's law of causation. But I feel that it is better to wait until this experimental work has been confirmed in other countries in which epidemic poliomyelitis occurs before proclaiming the microorganism as the established cause of the disease.

But what is of first importance is the discovery of the manner in which the microbic cause of poliomyelitis enters and leaves the body,

because the mode of infection so largely controls the methods of prevention to be taken.

Tests carried out on monkeys have proved beyond doubt that the virus of poliomyelitis, so-called, exists regularly upon the mucous surfaces of the nose and throat and often of the intestine, with the discharges of which it may gain access to external nature. It has also been traced on the upper respiratory mucous membrane of healthy persons who may act as carriers, and has been found in several instances in the tonsils removed by operation several months after recovery from the acute disease, so that the existence of so-called chronic carriers has also been indicated.

In spite of doubts and disputes concerning the mode of infection, this much we know positively, and hence should take sanitary measures accordingly: the infectious agent can and does enter and leave the body by the upper respiratory mucous membrane, and may at least leave the body with the intestinal discharges. Whether there are still other avenues of infection we do not know. Neither do we yet understand the tendency of the disease to reach its height in the late summer and early autumn months. But in attempting to interpret that phenomenon we must still keep in mind that increasing intensive study is showing more and more that cases of the disease extend throughout the winter, and in two instances at least midwinter epidemics occurred in Sweden and Norway.

Under the circumstances the disease is to be regarded as communicable from person to person—by the infected sick in any of the many forms in which it appears and by healthy persons who may be contaminated by the sick. It is, of course, not possible to control by isolation all exposed persons. But a large part of the problem of the public control of the disease rests on early and accurate diagnosis, and the reduction of exposure of persons who may become potential healthy carriers of the agent of infection.

What is greatly to be desired is a simple, readily applied biological test which would give practically unmistakable answer as to whether poliomyelities was present or not. Such a test has not yet been devised. We cannot use the cultures for this purpose because they are too difficult to obtain; we can, however, use lumbar puncture, which in 90 per cent. or more of instances yields a definite result. In general, it may be stated that, irrespective of the severity of the symptoms, lumbar puncture yields in cases of poliomyelitis a fluid, usually clear, but showing either morphological or chemical changes, or both these changes simultaneously. The mononuclear cells tend to be increased and globulin often is present. These changes in the cerebrospinal fluid, especially during periods of epidemic, should be regarded as presumptive evidences of poliomyelitic infection and measures of public protection taken accordingly. Moreover, as beginnings are being made in respect to a specific form of treatment, the employment of lumbar puncture and study of the

changes in the cerebrospinal fluid are affording the basis for the application of treatment at the more favorable periods, before contingent paralysis has appeared, which may often determine whether the treatment will be effective or not.

I must ask your indulgence for presenting a paper merely in outline. If the points presented impress you at times as being perhaps aphoristic, may I remind you that there exists competent, as I believe, clinical and experimental data for them all.

SOME PRACTICAL CONSIDERATIONS IN THE ADMINISTRATIVE CONTROL OF EPIDEMIC POLIOMYELITIS.[1]

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There are obvious practical limitations to the application of scientific laboratory and clinical knowledge in the public control of communicable disease. Furthermore, when the means of transmission, of immunization, and of detection of carriers of a disease are lacking the resources of the public health officer are sadly restricted. In view of the keen public and professional interest in the recent severe epidemic of poliomyelitis and the advantages which should accrue from a frank admission of the accepted facts, I venture to present the following statement of the situation as it must face professional advisers of public policies, so far as this particular disease is concerned.

The use of popular educational publicity will go far to teach parents the necessity of obtaining competent medical advice immediately upon the appearance of fever, pain, digestive disturbance, or acute symptoms of any kind in little children. Such advice is applicable at all times, but is listened to with respect only when the public is interested or is aroused to a particular danger. The benefit of following such advice is seen at once in the earlier home recognition of the common infections of childhood, a quicker appeal to the family physician, and in the more prompt and general reporting of communicable diseases of children to the health authorities. To the adoption of such advice we may attribute the decided reduction of the infectious diseases (pertussis, measles, diphtheria, scarlet fever, and infantile diarrhea) during the past summer.

The health officer can, with propriety, warn parents against allowing the indiscriminate association of children, and particularly against contact with children in whose families there are acute

[1] Read before the College of Physicians of Philadelphia, December 6, 1916.

illnesses of any kind. As a type of simple, direct, practical advice the following extract from a circular of information to the public will serve for issue through the field force and the newspapers:

INFORMATION FOR THE PUBLIC.*

"Infantile paralysis (poliomyelitis) is a catching disease. How it is spread is not yet definitely known. In most cases the disease is probably taken directly from a sick person, but it may be spread indirectly through a third person who has been taking care of the patient or through children who have been living in the same household.

The early symptoms are usually fever, weakness, fretfulness or irritability, and vomiting. There may or may not be acute pain at this time. Later there is pain in the neck, back, arms, or legs, with great weakness. If paralysis is to occur it usually appears from the second to the fifth day after the sickness begins. Many cases do not go on to paralysis.

The germ of the disease is present in discharges from the nose, throat, and bowels of those ill with infantile paralysis even in the cases that do not go on to paralysis. It may also be present in the nose and throat of healthy children from the same family. Do not let your children play with children who have just been sick or who have or recently have had colds, summer complaint, etc. For this reason children from a family in which there is a case of infantile paralysis are forbidden to leave their home. If you hear of their doing so report it at once to the Department of Health.

Persons over sixteen years of age, from families where there are cases of poliomyelitis, may continue at work unless their business has to do with the preparation or handling of food or drink for sale.

If you hear of a case in your neighborhood and the house is not placarded, notify the Department of Health.

How to Guard Against the Disease. In order to prevent the occurrence of this disease, parents should observe the following rules:

Keep your house or apartment absolutely clean.

Go over all woodwork daily with a damp cloth.

Sweep floors only after they have been sprinkled with sawdust, old tea leaves, or bits of newspaper which have been thoroughly dampened. Never allow dry sweeping.

Screen your windows against flies, and kill all flies in the house.

Do not allow garbage to accumulate, and keep pail closely covered.

Do not allow refuse of any kind to remain in your rooms.

Kill all forms of vermin, such as bed-bugs, roaches, and body lice.

Pay special attention to bodily cleanliness. Give the children a bath every day and see that all clothing which comes into contact with the skin is clean.

* Extract from leaflet issued by the New York City Department of Health, July, 1916.

Keep your children by themselves as much as possible. Do not allow them to visit moving picture shows or other places where children may gather.

Children should not be kept in the house; they should be out-of-doors as much as possible, but not in active contact with other children of the neighborhood. Do not take them on a street car, unless absolutely necessary, or shopping.

Do not allow your children to be kissed.

It is perfectly safe to let your children go to the parks and playgrounds if only two or three of them play together; they should not play in large groups, and you should not let them come into contact with children from other parts of the city.

Remember that children need fresh air in the summertime, and outdoor life is one of the best ways to avoid disease.

If there is a public shower bath in a school in your vicinity, send the older children there every day for a shower bath. This is perfectly safe and will help keep them in good health.

Give your children plain, wholesome food, including plenty of milk and vegetables.

Keep the milk clean, covered, and cold. Do not allow the milk or any other food to be exposed where flies may alight upon it.

Wash well all food that is to be eaten raw.

In Case of Sickness. Remember that during the hot weather children are apt to have stomach and bowel troubles. If your child is taken sick with loose movements of the bowels, or with vomiting, do not at once fear that it must be infantile paralysis; it may be simply digestive disturbance. Give the child a tablespoonful of castor oil and plenty of cool water to drink, and *send for the doctor at once.*

If you cannot afford a doctor's services, telephone the Department of Health and one will be sent free of charge.

If a doctor or nurse from the Department of Health visits your home, give them all the information you can. They are sent to show you how to keep your children well.

Do not give your children patent medicines or buy charms of any kind to ward off the disease. *The best preventive is cleanliness and strict observance of the rules that have been given.*"

And when the advice has been given, the most unexpected and extravagant applications of it may ensue. Many a family of children was housed for weeks, often in tight-shut rooms, even in July and August, the children's pale faces pressed against the window panes, mute evidence of their unreasonable imprisonment.

The mother whose neighbor's children across the tenement hallway are attacked with poliomyelitis, one of the four dying of the disease and another a permanent cripple, is not easily per-

suaded that the warning of the health officer in papers, circulars, and by the visit of the nurse does not logically demand home isolation of the well during the epidemic. When the visiting nurse is met by a door slammed in her face, where previously welcomed as the family's guardian and friend, we see how the laity reacts to the warning against contacts, the nurse being supposed to be constantly carrying disease from family to family. In the main, however, such educational propaganda is valuable but beyond this there is to my knowledge no warning or advice which can fairly be considered to produce any tangible results before or during an epidemic of poliomyelitis. There are sound reasons for advising the screening of living and eating premises against insects. There is always advantage in maintaining the person, the home, and the public highway in cleanly condition. Cooked food is safer than raw food for children in summer.

Up to the present moment there is no practical experience which can be claimed to show that environment, *i. e.*, housing, street dust, sewage, garbage, water, food supply, domestic or wild animals or insects, whether blood-sucking or not, has any relation to the origin or dissemination of poliomyelitis.

Aside, then, from the teaching of the principles of personal hygiene and avoidance of fatigue, the need of obtaining medical services in the presence of sickness and the probable advantage of avoiding contact between children during an epidemic, the hands of the health officer are tied by his ignorance of the means of transmission and the identity of carriers who do not show evidence of sickness.

When a case of sickness occurs the difficulties do not diminish. Diagnosis cannot be said to be either easily or positively made unless there is a paralysis present at some time. The increasing probability that there are as many non-paralytic as paralytic cases does not satisfy the parents of children, who naturally look for some positive proof, specific for the disease when it is diagnosed in a non-paralytic form, before willingly relinquishing their child to hospitalization or submitting to a quarantine.

We have no specific diagnostic test, though the spinal fluid considered in connection with a good history and definite clinical symptoms will, during an epidemic, even in the absence of paralysis, justify a positive diagnosis.

The discordant opinions of other physicians, whose services are commonly obtained by a resentful family when report of a case of poliomyelitis is made by the regular physician in attendance, bring the official diagnosticians of the Health Department into difficult relations with their fellow-practitioners, and not uncommonly result in feelings of resentment on the part of the family, which in one instance led to the institution of habeas corpus proceedings.

In a disease so little seen or recognized in the past in general practice it is not uncommon to lose that agreement and approval

among physicians without which it is obviously impossible to obtain public compliance with restrictions or professional coöperation with health officers so necessary for early and universal notification.

In the early days of an epidemic inevitably the diagnosticians of the Department of Health see more cases in a very short time than do other physicians, and if thoroughly trained under capable supervision they rapidly become experts to a degree which temporarily at least makes them appear critical of their fellow practitioners.

This difficulty is readily met by organizing public medical clinics and lectures at various points throughout the city where pediatrists, neurologists, and Health Department diagnosticians may give personal instruction in the early and differential diagnosis of poliomyelitis.

The prompt issue of leaflets of information to physicians, early in the epidemic, will enlist their coöperation and give the essential facts in a form for ready reference. Such a circular as the following proved a helpful starting-point with many for a more thorough understanding of the disease with which, at least in its epidemic manifestations, few were at all familiar.

INFORMATION FOR PHYSICIANS.*

"*Early Diagnosis.* The attention of physicians is called to the necessity of an early diagnosis of all cases of poliomyelitis. Early recognition and strict quarantine are the chief weapons against the disease.

Reporting of Cases. All suspicious cases must be at once reported to the Department of Health by telephone, to be followed within twenty-four hours by a written report. The ability of the Department of Health to limit the spread of the infection depends upon the immediate reporting of every suspicious case.

Age of Persons Affected. It should be remembered that this disease may occur at all ages, although the great majority of the cases are found in children between the ages of one and five years.

Type of Disease. Peabody, Draper, and Dochez, of the Rockefeller Institute, give the following classification of the disease:

1. The non-paralytic or so-called abortive cases.
2. The cerebral group, with spastic paralysis.
3. The bulbospinal group.

Methods of Infection. The experiments of Landsteiner and Popper in Germany; Kling, Pettersson and Wernstedt in Sweden, and of Flexner and Noguchi in this country have proved that the disease is transmitted by the secretions of the nose and mouth and the bowel discharges of an infected person. The infection is transmitted through the mouth, tonsils, and nasal mucous membrane.

Contacts and Carriers. It must be remembered that while the transmission of the *disease* from a patient to other members of the same family is not usual, transmission of the *virus* is common.

* Extract from a leaflet issued by the New York City Department of Health, July, 1916.

Experience warrants the assumption that in addition to direct contact the disease is spread by carriers, usually children, who are themselves immune but who harbor the infective material in their nasal or mouth secretions.

Symptoms. Early symptoms to be regarded as suspicious are: Fever, vomiting, slight diarrhea, listlessness, unusual fretfulness, and drowsiness. Later and more characteristic symptoms are: The appearance of weakness in any extremity, skin and muscular sensitiveness, spinal pain, especially on flexion, apparent or real rigidity of the neck muscles, Kernig's and MacEwen's signs.

Course and Duration of Disease. Paralysis appears usually before the sixth day of the illness; it may occur as early as the first day. Other symptoms, except spinal and muscular pain and rigidity and skin sensitiveness, rarely persist.

Non-paralytic or So-called Abortive Cases. Non-paralytic or so-called abortive cases are very frequent. In some epidemics they constitute from 25 to 50 per cent. of the diagnosed cases. The children have the early symptoms just mentioned, perhaps also the muscular tenderness and spinal pain. If carefully observed it may be noticed that they develop a paralysis of one or more groups of muscles, but that instead of the paralysis continuing it all disappears within a few hours. It is obvious that the recognition of such cases is of extreme importance in controlling the spread of the disease. The diagnosis of such cases is greatly facilitated by an examination of cerebrospinal fluid obtained through lumbar puncture.

General Care of Patient. Complete rest is of the utmost importance for either paralyzed or weak muscles for the first five or six weeks. Every effort must be taken to make this rest complete. The limb must not be allowed to drag on a paralyzed muscle. It should be supported by pillows or pads or bandages. There seems to be a greater tendency to atrophy if casts are used. A dropped foot may be supported by a sandbag or pillow; small rolls placed under the knee often hold the leg in a more comfortable position. The weight of the clothing should be kept off the legs by hoops or other device. If the head is somewhat retracted and the patient desires to lie on his back, he may sometimes be made more comfortable by a small pillow placed under the shoulders, allowing the head to fall back. The value of electricity for treatment in the first six weeks is very doubtful. In many instances it may do harm. Massage or passive movements should not be begun for at least five or six weeks and then should be used with great care. In cases that show a tendency to clear up rapidly the child should be kept in bed for some time after the ability to use the muscles returns. It should never be encouraged to try to stand or to use the muscles otherwise until a considerable time has passed.

Period of Incubation and Duration of Disease. The incubation period has been officially set at two weeks. Non-immune, infected persons usually manifest symptoms of the disease in from five to ten

days after exposure. The average period of incubation is seven days. The early symptoms, noted above, usually last from one to seven days. Quarantine of the patient will be maintained for a period of at least eight weeks.

Prevention of Spread of Infection. 1. The children from an infected family will be confined to the house. (See "Quarantine.")

2. During the continuance of an epidemic of poliomyelitis children should not be allowed to congregate in public places.

3. Fresh-air outings or vacation camps are allowed, if kept under competent medical supervision, with an adequate physical examination of each child before enrolment and the exclusion of any child from an infected family.

4. Absolute cleanliness of all homes is essential; such cleanliness should include:

(*a*) Screens in all windows.

(*b*) Flies kept out of all rooms.

(*c*) Thorough cleanliness of all floors, woodwork, bedding, and clothing.

(*d*) Avoidance of dust (all sweeping should be done after the floors have been sprinkled with sawdust, bits of newspaper, or tea leaves, all thoroughly moistened).

(*e*) Garbage cans kept closely covered and washed out in hot soapsuds after they have been emptied.

(*f*) No refuse, either of food or other waste, allowed to accumulate.

5. Personal habits of cleanliness are essential; the hands should be washed before each meal, after each visit to the toilet, and before going to bed. Children should be warned about putting the fingers into the mouth or nostrils.

6. When sneezing or coughing, a handkerchief should be held over the mouth. Kissing of children is also a dangerous practice and should be avoided.

Procedure to be Followed in Each Case. 1. Isolation of patient: Complete isolation of the patient must be maintained until terminated by order of the Department of Health.

2. A separate room must be provided for the patient. No one must be allowed in this room except the attending physician, the nurse, and the representative of the Department of Health.

3. Care of patient's room and surroundings: (*a*) All rugs, carpets, draperies, and unnecessary furniture must be removed before the patient is placed in the room.

(*b*) All windows must be screened.

(*c*) The sick room must be kept well aired at all times.

(*d*) The woodwork must be wiped daily with damp cloths. Under no circumstances must the floor be swept when it is dry. It should be sprinkled with sawdust, bits of newspaper or tea leaves, all thoroughly moistened and then carefully swept so that no dust may arise.

(*e*) Toys and books used by the patient must be destroyed by burning after recovery or death.

(*f*) Household pets must not be allowed in the room.

4. Care of bedding: All cloths, bed-linen, and personal clothing which have come into contact in any way with the patient must immediately be immersed in a 5 per cent. solution of carbolic acid and allowed to soak for three hours. They may then be removed from the room and must be boiled in water or soapsuds for fifteen minutes.

5. Care of discharges from body: A sufficient supply of gauze or clean linen or cotton cloth must be provided and all discharges from the nose and mouth of the patient received on these cloths. After use they must be immediately burned or boiled. Bowel discharges and urine must be covered at once with chloride of lime and then disposed of by emptying into a water closet.

6. Care of utensils used by patient: Plates, cups, glasses, knives, forks, spoons and other utensils used by the patient must be kept for exclusive use and under no circumstances removed from the room or mixed with similar utensils used by others. They must be washed in the room in hot soapsuds and then rinsed in boiling water. After use the soapsuds and water must be thrown into the water-closet.

7. Nurse: A trained nurse or competent attendant must be in sole attendance upon the patient. She must not be allowed to mingle with the rest of the family but must be isolated with the patient. The hands of the nurse must be carefully washed in hot soapsuds after each contact with the patient and before eating.

8. Termination of case: After the case has been ordered terminated by the Department of Health the following procedure must be followed:

(*a*) The entire body of the patient must be bathed and the hair washed with hot soapsuds. The patient should then be dressed in clean clothes (which have not been in the sick room during the illness) and removed from the room.

(*b*) The nurse should also take a bath, wash her hair, and put on clean clothes before mingling with the family or other people.

Action Taken by the Department of Health in Each Case. Placarding: Every house will be placarded without exception. In private houses one placard is placed on the street front (outside of house), and one placard is placed on the door entering the room patient is in. In tenements three placards are affixed, one on street door, one in entrance hall, and one on door of apartment. All placards are dated.

Quarantine: In all families where a case of poliomyelitis has occurred all other children under sixteen years except those who have had the disease are to be quarantined in the home until two weeks after the termination of the case by death, removal, or recovery.

The patient, whether at home or in hospital, must be quarantined for eight weeks from onset of disease.

Children under sixteen years of age who have been, but no longer are, exposed to infection will be quarantined for fourteen days.

Removal to hospital: No case is to be left at home unless the following conditions are complied with:

(*a*) There must be a private physician in attendance regularly.

(*b*) Persons attending patient must obey quarantine rules; must not do any housework, marketing, or leave premises.

(*c*) Patient and attendant must have separate rooms.

(*d*) All windows of rooms used by patient must be screened.

(*e*) The family must have a separate toilet for its exclusive use.

(*f*) Quarantine regulations must be strictly observed by patient and other children.

Deaths: In case of death prompt burial is required, the coffin must be sealed as in deaths from other contagious diseases, and the funeral must be strictly private. Church funerals are prohibited.

Spinal puncture: Physicians desiring the services of a consultant to perform lumbar puncture and report on the examination of spinal fluid should telephone to the Department of Health."

Once the diagnosis is accepted by family and physician, the next step is fairly clear. Contact is effectively prevented in hospitals and less consistently in the home even when there is unusually intelligent and favorable care. Removal of the sick child to a hospital, if accepted by parents, is a simple matter; if opposed, it may prove the irritant which sets a whole community against the simplest and gentlest measures of restraint. Anything which causes antagonism of the public to the policy of reporting and removal to isolation hospitals, develops deception, hiding of cases, and such methods of obstruction as to frustrate to a great degree any approach to successful separation of the sick from the well. Once the case is under surveillance at home or in hospital the uncertainty as to a reasonable period of isolation becomes prominent. The parents and the press ask embarrassing questions. What is the duration of infectiousness? If six weeks is not certain is six months any more so? Why eight weeks in New York City and six weeks elsewhere throughout the country? Six weeks has been generally agreed to as a suitable isolation period dating from the day of onset, the only adequate basis for this being that, after six weeks, infectious material has rarely been obtained from artificially infected monkeys. We established the isolation period at eight weeks in New York City at the beginning of the epidemic, to impress the public with the seriousness of the danger and partly to obtain a greater percentage of voluntary hospital admissions. There is no reason to believe that eight weeks' isolation of infected

individuals is of any more value than the more commonly accepted six weeks' period.

How long the incubation period? Is a child recovered from paralysis still infectious? How long before the disease expresses itself has a patient been infectious? Only provisional answers can be offered to any of these questions.

Whether or not hospitalization justifies itself as a sanitary measure to protect susceptibles against exposure to infected individuals, it has resulted in definite and marked improvement over the usual treatment given to the children of the poor in their homes during the acute stage of the disease and in the prevention of much avoidable subsequent deformity.

There are too many undetermined factors which may have played a part, to draw positive conclusions as to the effect of hospitalization upon the distribution of poliomyelitis in New York, but it is certainly suggestive that in the Borough of Manhattan where more than 90 per cent. of all reported cases were removed to hospitals, the case incidence of the disease was 0.94 per 1000, while in Brooklyn, where not over 50 per cent. of the cases were taken from their homes for isolation purposes, the case incidence was 2.24 per 1000 of the population.

The unusual opportunity offered by the assembling of such a number of acute cases and holding them for a long isolation period should not be lost to the medical profession. Postgraduate clinical teaching should be carried on as systematically as the emergency conditions prevailing will permit.

More than 800 physicians visited the wards of the Willard Parker Hospital, where, for a considerable period we had under observation 2078 cases of the disease. During the epidemic we had a total of 5437 cases under treatment in the hospitals of the Department of Health.

Health officers owe it to the practitioner of medicine to see that every facility is given to study and observe all clinical phases of the disease, and to inform himself as to the possibilities of early and accurate diagnosis and promising or unprofitable methods of treatment.

It is impracticable to allow each patient to be treated by the family physician, and it is undesirable to allow more than the minimum of visits by family or friends. Two visits by members of the family in eight weeks was our rule, and in this way we avoided the development and spread among the patients of the other communicable diseases of children. Complete exclusion of the family would prevent public support of the policy of hospitalization.

Morphological, cultural, and biological tests for the presence of the infecting organism are not yet sufficiently precise or uniform to offer any service to the public health officer. The detection of carriers or of the infectious preparalytic or non-paralytic cases is thus impracticable.

As to general measures of personal restraint directed to the abatement or prevention of an epidemic we are even more at sea than in the field of individual quarantine. As a means of impressing upon the public the seriousness of the epidemic and the need of caution, various measures may be justified, among them the ban upon public assemblages of children within confined spaces, except where medical or nursing supervision and identification of homes or addresses of children could be maintained.

Identification of travelers, especially of children, and their supervision at their place of arrival for the presumed incubation period of the disease is another reasonable means of controlling obvious transmission of the disease; but the incompleteness of this under modern conditions of traffic and in view of the probability of the presence of large numbers of healthy carriers, children and adults, makes its advisability very questionable.

The alternative, one may say, is the absolute quarantine against people coming from places where the disease is prevalent. I hardly need to recall the countless instances of inconvenience, hardship, yes real brutal inhumanity which resulted from the application of the general quarantine of counties, towns, and States against each other during the past summer. I do not know of any health officer who can or has maintained that such measures have had the slightest effect upon the incidence or spread of the disease in his jurisdiction, and I know that nothing has developed so many automobile detours, such ingenuity in the violation of the laws, and such whole-hearted disrespect for reasonable sanitary law and its enforcement.

General reporting by the health officer at the point of departure to the health officer at the place of destination of travelers under the age of sixteen years would probably accomplish all that can be expected. Modern methods of sanitary control are directed toward localizing the disease in the person of the sick individual. Interference with the traveling of healthy people cannot be legally justified, nor will it be cordially supported by the public until health officers can make good their ability to detect and prove the presence of the virus in any one other than those actually suffering or recently recovered from the disease, and in a way that will not materially hinder personal freedom.

In the case of diphtheria, typhoid, cholera, cerebrospinal meningitis, tuberculosis, and malaria carriers we can with but insignificant inconvenience to the individual protect the public by the use of simple and accurate methods of diagnosis. Furthermore, the rapidity and irregularity of the spread of the disease to other communities develops amazing and laughable inconsistencies in any efforts at local quarantines, as, for example, was the case of quarantines enforced by various communities in New Jersey, Connecticut, and Long Island when the communities outside the city showed a

case incidence in some instances from two to four times as high as that of New York City itself.

If it is admitted that consistent and scientific control of communicable diseases is properly directed to preventing the escape of infectious material from the immediate person or vicinity of the infected individual, and if we can believe the records which indicate that epidemics of poliomyelitis do not occur in schools and institutions as they do commonly in the case of other communicable diseases of childhood, then interference with attendance of children at school is hardly excusable except as a concession to the apprehension of parents. This applies with still greater force to the application of prohibitory regulations to institutions of learning for students of sixteen years or over. The experience in New York City in the public schools and in the City College and other colleges and trade schools fully supports this view.

It is to be deplored that many private schools and colleges adopted regulations calculated to protect their patrons, though with the reasons for their measures based more upon the fears of the parents than upon any probable protective results. The managers of schools and colleges, depending for their income and the support of benefactors upon the good-will of present or prospective students and their parents, may find it good policy to take extraordinary precautions to prevent the invasion of poliomyelitis with the assembling of students for the fall term. One of the results of such additional restrictions has been the development of a feeling often expressed that the children of the poor were but doubtfully protected by the public officers, while the rich received the benefit of a wiser and more conservative policy. Nothing in our experience with the 900,000 public school and parochial school children in New York City gives any support to this point of view.

Uniformity of action among school and college principals in September would have gone far to allay public alarm instead of permitting additional confusion in the public mind and inconveniencing to no good purpose many thousands of families.

Unless there are demonstrable results to be expected from the application of more drastic regulations, those adopted by qualified public health authorities should be accepted and followed by private governing bodies of schools, and colleges, with the approval and advice of their own medical consultants.

Just as interstate uniformity of procedure is advisable under Federal supervision, so intrastate regulations in the several towns, etc., should be as nearly identical as possible.

While awaiting the receipt of the essential information which will justify a logical and efficient administrative control of epidemic poliomyelitis, the health officer of any community can hardly do better than plan his campaign in matters of regulation and public

education in accordance with the declaration of the American Public Health Association, which I take the liberty of quoting in full:

"The specific cause of poliomyelitis is a microörganism, a so-called virus, which may be positively identified at present only by its production of poliomyelitis in monkeys experimentally inoculated. Such experiments have shown this virus to be present not only in the nervous tissues and certain other organs of persons who have died of poliomyelitis, but also in the nose, mouth, and bowel discharges of patients suffering from the disease. It has been proved by similar experiments that healthy associates of poliomyelitis cases may harbor the virus in their noses and throats.

These experiments, together with the fact that monkeys have been infected by direct application of the virus to the mucous membrane of the nose and by feeding of the virus, are strong evidence that in nature infection may be directly spread from person to person.

Observations on the occurrence of the disease might seem at first thought to be inconsistent with this conception, since contact between recognized cases can seldom be traced. However, this may be adequately explained by the lack of means for detecting mild non-paralytic cases, and by the belief that healthy carriers of the virus and undetected cases are considerably more numerous than frankly paralyzed cases.

Many facts, such as the seasonal incidence and rural prevalence of the disease, have seemed to indicate that some insect or animal host, as yet unrecognized, may be a necessary factor in the spread of poliomyelitis, but specific evidence to this effect is lacking, and the weight of present opinion inclines to the view that poliomyelitis is exclusively a human disease and is spread by personal contact, whatever other causes may be found to contribute to its spread. In personal contact we mean to include all the usual opportunities, direct or indirect, immediate or intermediate, for the transference of body discharges from person to person, having in mind as a possibility that the infection may occur through contaminated food.

The incubation period has not been definitely established in human beings. The information at hand indicates that it is less than two weeks, and probably in the great majority of cases, between three and eight days.

If the foregoing conception of the disease is correct, it is obvious that effective preventive measures approaching complete control are impracticable, because isolation of recognized cases of the disease and restraint upon their immediate associates must fail to prevent the spread of infection by unrecognized cases and carriers.

These difficulties would appear to be inherent in the nature of the disease. Nevertheless, we may hope for the development of more thorough knowledge which will permit of more effective control of the disease than is now practicable. Of first importance is the more general recognition by practitioners of non-paralytic cases through clinical observation and laboratory procedures.

Lumbar puncture has been shown to offer valuable aid in diagnosis and a more general use of this test is to be encouraged, since it not only facilitates accurate and early diagnosis, but in many cases affords symptomatic relief as a therapeutic procedure. Without undertaking to predict the future progress of research, we may hope for certain possible developments which may afford far more effective control of the disease, with substantial relief from many inconveniences at present inevitable. Among these possibilities we would include: a practical test for the detection of all clinical types and carriers; a simple and reliable test for distinguishing between susceptible and insusceptible persons; and means of conferring artificial immunity against poliomyelitis.

At present our information demands the employment of the following administrative procedures in attempting to control the disease:

1. The requirement that all recognized and suspected cases be promptly reported.
2. Isolation of patients in screened premises. The duration of infectivity being unknown the period of isolation must necessarily be arbitrary. Six weeks has been recommended by the Conference of State and Territorial Health Officers with the Surgeon-General of the Public Health Service as sufficient, and this period has been generally accepted throughout the United States.
3. Disinfection of all body discharges.
4. Restriction of the movements of intimate associates of the patient so far as practicable. This should include at least exclusion of the children of the family from schools and other gatherings.
5. Protection of children so far as possible from contact with other children or with the general public during epidemics.
6. Observation of contacts for two weeks after the last exposure.

There is no specific treatment of established value in poliomyelitis. During the persistence of the acute symptoms of the disease the important principles of treatment are rest in bed, symptomatic relief, and passive support for the prevention of deformities. Active measures during this stage are not only useless but are apt to cause serious and often permanent injury. Hospitalization of patients when possible is to be encouraged. The best chances of recovery from residual paralysis demand skilful after-care, often long continued, and always under the direction of a physician familiar with the neurological and orthopedic principles of treatment. The provision of such after-care often becomes a community problem,

demanding the coöperation of all available agencies, social and professional."

As a matter of historical interest and to present the result of the experience of the Department of Health of the City of New York, I append the following text of information for field workers which describes the procedure in the various phases of the work undertaken in the effort to check the spread of the disease last summer.

"1. GENERAL INFORMATION. *Incubation Period.* The incubation period of the disease and the quarantine period of children under sixteen years of age who have been, but no longer are, exposed to infection has been set at fourteen days.

Quarantine. In all families where a case of poliomyelitis has occurred, all the children under sixteen years (except those who have had the disease) are quarantined in the home until two weeks after the termination of the case by death, removal, or recovery. The patient, whether at home or in hospital, is quarantined for eight weeks from the date of onset of the disease. No case in hospital may return home until quarantine is ended.

Placards. All premises where a case of poliomyelitis occurs are placarded, the only exceptions being hotels and boarding houses, which are not placarded provided patient is at once removed to hospital, the room or rooms immediately disinfected, and no quarantined children remain on the premises. In private houses one placard is placed on the street wall of the house and one on the door entering room the patient occupies. In apartment and tenement houses three placards are posted—one on the street wall, one on the wall of the entrance hall, and one on the door of the apartment. All placards must be dated and initialed.

Removal to Hospital. No case may be left at home unless the following conditions are complied with:

(*a*) There must be a physician in daily attendance.

(*b*) The patient must have a special attendant who must obey quarantine regulations and must not do any housework, marketing or perform any household duties for other members of the family. He or she can, however, leave the house provided the necessary precautions as to personal disinfection, etc., are observed, but should avoid all children.

(*c*) The patient and the attendant must have a room, or rooms, separate from the rooms of others in the family.

(*d*) All the windows of this room must be screened and all flies in the room killed.

(*e*) The family must have a separate toilet for its exclusive use.

(*f*) Quarantine regulations must be strictly observed by the patient and the other children of the family, if any. When the

disease occurs in the premises of families of food handlers the employment of such person or persons at this occupation is forbidden, unless they occupy entirely separate apartments for a period of two weeks after the removal, recovery, or death of the patient.

(*g*) Disinfection and renovation: The personal and bed-linen of the patient must be properly disinfected and, after removal, recovery or death of the patient, complete renovation of the room or rooms occupied by the patient and attendant is required.

2. Duties of Inspectors. Cases are reported by physicians, nurses, social workers, and other citizens, and all are visited at once by inspectors, even those reported by physicians, with request that they be admitted to hospital. Attending physicians to Department Hospitals may admit cases direct, without inspector's visits.

The janitor or his representative must be seen in every instance and notified that he or she will be held personally responsible by the Department for keeping quarantined children in the family premises and seeing that placards are not removed or defaced.

If the inspector makes or confirms the diagnosis of poliomyelitis, the Borough Office of the Department is notified and by it the ambulance is summoned, if removal is indicated. In every case the inspector leaves the hospital admission slip, properly and fully filled out. When case is left at home, inspector must give full instructions to family.

All cases of questionable diagnosis must be seen at once in consultation with the Borough or Chief Diagnostician, and whenever it is required, spinal puncture will be made and laboratory report submitted by the staff of the Research Laboratory. Cases with positive laboratory findings will be considered as poliomyelitis, regardless of clinical signs. A full history must be recorded on a special card for each assignment covered by inspectors.

3. Duties of Nurses. Nurses will visit every case reported, to instruct the family regarding quarantine, and every other family in the house:

(*a*) That there is a case of this disease in the house.

(*b*) That the other children of the family in which the disease has occurred will be quarantined, and that should they fail to observe quarantine, that fact should be immediately reported to the Department of Health, when steps will be taken to enforce quarantine by a summons to Court.

(*c*) Regarding home cleanliness, personal hygiene, the danger of infection by flies, and other general measures which should be taken to prevent infection.

(*d*) To report at once to the Department any cases of suspicious illness of children, or any case of poliomyelitis, especially if there is no physician in attendance.

A current history must be kept by the nurse for every case, giving dates of visits, action taken, and date and mode of termination.

Nurses must see the janitor or his representative on first visit, and repeat the instructions given by the inspector.

Patients remaining at home and families with quarantined children are visited daily by the nurse or patrolman for the maintenance of quarantine, and oftener if necessary. After removal, recovery or death of the patient, nurses issue renovation notices, following these up by visits until complied with.

4. Duties of Sanitary Police. These officers visit frequently—daily if necessary—quarantined premises, to enforce quarantine of patient and other children in the family, and to affix or replace placards. They serve summonses when quarantine regulations are violated and appear in Court.

5. Ambulance Surgeons. All cases ordered removed to hospital must be removed by the ambulance surgeon without question, with the following exceptions, in each of which the ambulance surgeon must first obtain telephone authorization from the Resident Physician of his hospital to leave the case at home:

(*a*) When removal would endanger life of child (bulbar cases).

(*b*) When family physician can show that requirements will be met at once (or within twelve hours).

Doubtful and mixed infection cases must be removed by themselves in a separate ambulance.

In every case ambulance surgeons must leave a card with parents, giving name and address of hospital to which patient is taken. If inspector has not left admission slip, surgeon must make out same.

6. Visitors to Hospitals. Each case may be visited twice during its stay in the hospital by a parent or guardian. If child is critically ill the guardian or parent will be notified and will be permitted to visit daily while child is dangerously ill. Information relative to condition is given out at the Information Desk in each hospital, or by telephone in response to telephone inquiry from the parent or guardian.

7. Certificates for Children Leaving the City. The Department of Health of New York City does not require certificates of anyone leaving or entering the city. It issues certificates only as a convenience and aid to persons leaving the city. None are issued to persons passing through the city.

Such certificates state that the persons or family therein named have not resided in a house where a case of poliomyelitis has occurred. The applicant must sign a request for the certificate. They are refused to persons who live in a house where a case of infantile paralysis has occurred or who present symptoms of the said disease.

The certificates are good only until midnight of the following

day, except when issued on a Saturaday or on the day preceding a holiday, when they are good until midnight of the second following day.

Persons Leaving New York State. Officers of the U. S. Public Health Service, stationed at transportation terminals, require the above certificates before they will permit children under fifteen years of age, resident in New York City, traveling to points outside the State of New York, to leave the city. The original applicant must again sign the certificate in the presence of the Federal Health Officer. Federal Health Officers do not require certificates of any adults.

Persons Going to Points within New York State. Residents of New York City, adults or children, traveling to points within New York State, who present certificates of good health from their family physicians, may also obtain the above certificates from the Department of Health. If no physician's certificate of good health is presented, applicants will be examined by a physician and their freedom from symptoms of poliomyelitis certified; in this case all children must be brought to the proper office of the Department.

8. Return of Cases of Poliomyelitis to New York City. Cases of poliomyelitis occurring in residents of New York City who are temporarily residing outside the city, and developing within two weeks of the time of leaving the city, will be permitted to return, provided (*a*) a private conveyance (private car, private automobile, carriage or ambulance) is used, and (*b*) the patient goes direct to a hospital authorized by the Department of Health to care for cases of poliomyelitis.

Cases in which the onset of the disease occurs two weeks or more after leaving the city, may not return to New York City until eight weeks from the date of onset of the disease. But in special cases, where proper medical, surgical and nursing care is not obtainable, patients may be brought back to the city in a private conveyance, providing they go directly to a private room in a private hospital authorized by the Department of Health to receive cases of poliomyelitis.

9. Return of Children Who Have Been Exposed to Poliomyelitis to New York City. Children under sixteen outside of New York City who have been exposed to infection with poliomyelitis within two weeks, may return to the city under the following conditions:

They must come by private conveyance and must go direct to their homes.

Advance notice must be sent, and authorization obtained, by telephone, by the local Health Officer. Such notice must give the name and age of each child, together with the identified address,

including the floor, and the latest date of exposure to infection, and must be followed immediately by a written notice.

Such children will be promptly visited at their homes by a representative of the Department of Health, and instructed as to nature and duration of quarantine. They must not leave the premises until two weeks have elapsed from the date of last exposure to infection.

The premises are not placarded, but the children are visited at regular intervals, and should quarantine be violated the parents or guardians are summoned to Court and fined."

POLIOMYELITIS: THE PREPARALYTIC STAGE AND DIAGNOSIS.

By John Ruhräh, M.D.,
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To anyone who has passed through one or more epidemics of poliomyelitis, or who has become thoroughly conversant with the disease through reading, the following pages will be of only passing interest; but I am convinced from my association with other physicians, particularly in seeing cases of the disease, that an article dealing with the preparalytic stage, with the findings in the cerebrospinal fluid, and a few points on the differential diagnosis will be welcomed by many. The old idea of the disease and its clinical paralytic form has become fixed in the minds of the medical profession, so that it will need repeated contributions to eradicate these earlier conceptions of it. I have had, during the past six months, a rather unusual opportunity of seeing a large number of cases, and it was with pleasure that I responded to the invitation of the editor to prepare the following pages.

The Abortive Form and Preparalytic Stage. Wickman, in his marvelous monograph, divides the abortive cases into four classes:

1. Those with the course of a general infection.
2. Those showing meningeal irritation.
3. Those with marked pains suggesting an influenza.
4. Those with accompanying gastro-intestinal disturbances.

To this one might add a fifth, for the purpose of calling attention to it, of an anginal form, or those beginning with definite sore throat.

It should be borne in mind that poliomyelitis is a disease which, probably in a very large proportion of cases, does not involve the nervous system to such an extent as to cause special symptoms, and the cases characterized as abortive are merely those which go through a preparalytic stage without having any definite paralysis following. If this point is borne in mind it simplifies the conception

and also the description of these cases, for what is true of the abortive cases is equally true of the preparalytic stage of the ordinary form of the disease. Doubtless a great number of the so-called abortive cases have muscular weakness or even paralysis of a very limited amount. It is extremely difficult to detect even marked difference in muscular power in very young infants, so that the lesser degrees of loss of power may easily escape notice even after the most searching and repeated examinations.

The onset of the disease is usually sudden. Occasionally the onset is gradual and it may not be possible to tell exactly when the child was taken ill. The severity of the initial symptoms bears no relation whatever to the subsequent course of the disease, as one sees a very mild onset followed by most extensive paralysis and even death, and other cases coming in a most fulminating manner which subsequently clear up entirely. The first thing observed about the child is that it is ill, and of all the symptoms noted fever is the most constant. There are, perhaps, exceptional cases in which the febrile stage is slight and short and so easily overlooked by ignorant or careless parents; but in cases under careful observation the afebrile attacks are certainly most exceptional. The second most notable symptom is the presence of pain, and in children old enough to locate the pain, headache is, next to fever, the commonest symptom. The pains may be in any part of the body and may be so marked as to overshadow all other features of the disease, or they may be so trifling as to be only elicited by special examination, with all gradations in between. The commonest pain next to headache, and of decidedly more value in diagnosis, is a tenderness and pain along the spine and down the legs reaching to the heels or even the soles of the feet, and another very common and suggestive pain is that in the neck and back of the head. If the head is bent forward this is usually greatly increased, causing the child to cry out and resist very markedly. If there is not much pain present it can usually be elicited by bending the legs up and the head forward, so as to flex the spine. In some children the pain is present only when one attempts to move the arms or legs or various parts of the body; in others it is spontaneous and the child cries most of the time with it; and in still others there is a hyperesthesia, so that the slightest touch without any movement whatever elicits an unusual degree of suffering. In some cases pain is elicited on gently squeezing the muscles. In many cases there is slight stiffness of the neck and the child assumes a very suggestive attitude, lying on one side or the other, but not on the back, so that the head may be thrown slightly backward. The legs are usually drawn up, although not always. The disease may be ushered in with a convulsion, or convulsions may occur in the course of the disease.

The mental condition is extremely interesting. The commonest form of disturbance consists of very marked drowsiness, which is

replaced by a most extraordinary irritability when the child is aroused; but when one ceases to examine him he rolls over into his former position and dozes off again. Other children are extremely restless and irritable and some are wideawake with a hyperacute mentality. With this is a very evident delirium or a tendency to delirium. These cases, in my experience, are of the worst possible type and usually die. In some children there is a very marked delirium—talking, muttering—and this is accompanied by a tendency to move about in the bed and change the position frequently. Often the moving about is exceedingly suggestive, the child tossing from side to side and not lying in any position more than a few moments, sitting up, standing up, and half turning from side to side in a perfectly purposeless way. If the child is watched carefully it will very often be seen to have fibrillary twitching of the muscles; at other times whole muscles will tremble. In rare instances the muscle is more or less spastic and may stiffen when the extremity is taken hold of to relax a few moments later.

The gastro-intestinal symptoms are not uncommon. Anorexia is the rule. Vomiting may be present and may be so marked as to suggest an acidosis. Constipation is rather more common than diarrhea, but the latter is frequently met with. The throat is often reddened; the redness is general and not limited to the tonsils, and in some cases there is a considerable amount of coryza and slight suffusion of the eyes. Another curious feature met with both early and later on in the disease is the tendency to profuse sweating. This may be as marked as the colliquative sweats seen in typhoid. Sometimes the sweating is limited to one part of the body, as to the face or neck, or to one extremity, sometimes to one-half of the face. In some cases there may be retention of the urine, and this should always be looked for.

Usually, as Wickman has suggested, the disease presents certain dominant features. The cases which are like the course of a general infection have nothing to suggest the diagnosis, or they may have some of the things mentioned above, the general history of the attack being that the child is taken ill suddenly with an attack of vomiting followed by a fever of from 101° to 103° or 104°, or sometimes higher, with headache, and feeling very badly, but without any definite symptoms of any kind. This may clear up in twenty-four hours, or it may last two, three, or rarely four days, when the symptoms disappear entirely and the child has nothing whatever to show for it. These cases may be seen in connection with two or three or more cases in a family or group of children, and the diagnosis is made or suspected by the fact that the child was taken ill at the same time with identical symptoms or nearly so, to one or more definite cases of the disease in the immediate surroundings. These cases present the greatest difficulty in diagnosis.

The meningeal form is the most suggestive of all, and one almost

immediately realizes that he has either to do with a beginning poliomyelitis, a meningitis, or a meningismus. In these cases, when the patient is examined, it will be found there is an anterior and posterior stiffness of the neck; Kernig's sign may be present or absent; McEwen's sign elicited by percussing and auscultating the cranium may be present, owing to the distention of the ventricles of the brain with the fluid; and the patient may show a very characteristic sign at this time, or usually a little later, which may be described as follows: If the patient is raised by placing the hands under the shoulders the head will fall back. If the child is told to raise the head when it is sufficiently conscious, it will do so and hold it forward a moment or so and the head will again fall back. This is a sign of very great importance. In some cases there is a curious vasomotor disturbance which is most often seen in the cases of the meningeal form. This consists of an alternate blushing and paling of various areas of the skin. It may be over small spots or over large areas, the part affected being redder than normal, and then after a varying time it may become paler than the surrounding skin or present a normal appearance. Sometimes the flushing is very transient and is only a momentary wavering flooding of the superficial vessels. There is practically never any question in these cases with a meningeal irritability of the advisability of a lumbar puncture, and it should be done as soon as possible, and this usually clears up the diagnosis immediately. The cases with marked pain, resembling influenza, should suggest poliomyelitis. In my own experience I have rarely seen cases of influenza with as much pain, or with the kind of pain, as described above, although they do occur. In these cases a lumbar puncture should be done to settle the question of diagnosis.

The gastro-intestinal cases are more difficult because one does not always have in mind the possibility of a poliomyelitis. The child is taken with a fever with intense vomiting, and if it has had a history of acidosis with vomiting before this the physician may be thrown off his guard. In some of these cases, if the child is carefully observed, some of the special features mentioned above may be elicited, but if they are absent the diagnosis may be impossible. The presence of a very marked diacetic acid reaction in the urine will incline one to believe that the case is one of acidosis, though it must be borne in mind that any febrile condition will show diacetic acid in the urine, although the reaction is not as marked.

The cases with sore throat and coryza are also difficult and practically impossible to tell unless a careful examination elicits some suggestive symptoms or signs. This preparalytic stage, when it does not go on to the development of a paralysis, is what we have called an abortive case, and may subside in twenty-four hours, or it may last two, three, or four days, occasionally five, six, seven, or eight days; in a few instances longer, but rarely. In some of

these cases the convalescence may be slow and the child may suffer with indefinite symptoms for days or even weeks after the attack. These consist chiefly of pain coming on at any time, but more often at night, sometimes waking the child up out of sleep. These pains are usually transient and disappear either spontaneously or after rubbing the affected parts. In some instances the pain is accompanied with cramps in the muscles. The child may tire readily on exertion even though it has shown no paralysis or loss of power, or the tiring may be localized to certain groups of muscles or to one extremity. When this is the case one might assume that the spinal cells supplying this part have been affected. If the child is old enough to make special tests of the power of the muscles according to the method suggested by Lovett the diagnosis may be even more certain.

THE CEREBROSPINAL FLUID. The cerebrospinal fluid in practically all cases, certainly in almost all if not all of the cases which show nervous symptoms, is abnormal and may present a number of different changes which, in the main, are constant. The fluid is sterile, usually clear, and sometimes a slight fibrin web forms in it. In exceptional cases the fluid may be cloudy or even bloody. Usually the presence of blood means a faulty technic, the error generally being the use of a needle without a sufficiently close-fitting obturator. The number of cells is definitely increased. The normal fluid contains from five to ten cells per cubic millimeter, while in poliomyelitis the number of cells is increased from sixteen to twenty to one hundred, but in some instances this number is greatly exceeded, as high as five hundred or over being met with. In the early stage of the disease, before the paralysis has made appearance, the chief type of cell found is the polymorphonuclear. Sometimes they form from 80 to 90 per cent. of the cells present. After the appearance of the paralysis the cells found are chiefly lymphocytes, and from 75 to 100 per cent. of the cells present are of the mononuclear type. There is also the presence of large mononuclear cells of an endothelial type which have been regarded by DuBois and Neal as rather characteristic of poliomyelitis. There are also phagocytic cells present. It must be borne in mind that even a slight admixture of blood will account for a certain number of polynuclear cells. The cells rapidly disappear from the cerebrospinal fluid, so that after the first two weeks the count is either normal or nearly so. The fluid is sterile, gives a positive Fehling's reaction like the normal fluid, and usually contains a very definite reaction for globulin, which is, however, not as pronounced as that found in the various forms of meningitis. During the first week the globulin is found in perhaps one-half of the fluids examined. Pandy's test will, as a rule, be found easy and reliable. The globulin increases, as a rule, until about the third week, when it decreases, but a slight increase may be detected even after seven weeks or longer. The

reaction to Fehling's solution is of slight value in diagnosis, inasmuch as in tuberculous meningitis, and sometimes in meningitis due to other organisms, this power to reduce Fehling's solution is absent. If the reaction is present it means nothing, if it is absent it is a point against poliomyelitis.

The fluid in meningismus is increased from 10 to 100 c.c., is sterile, clear, and contains very few cells. Albumin and globulin may be present in very slight traces, or may be absent, the reaction never being anything approaching that seen in poliomyelitis. The Fehling's solution is reduced and animals inoculated with the fluid gave negative results. In tuberculous meningitis, which may resemble poliomyelitis closely, the fluid is usually markedly increased from 30 to 120 c.c. or more, and is usually under decided pressure. On standing a clear fibrin web usually forms, and this is much more marked than the slight web sometimes seen in poliomyelitis; in practically no other fluid is such a dense web seen. This contains a great many cells, and after transfer to a slide and stained, tubercle bacilli may usually be demonstrated if a sufficient amount of time is given to the search. I do not remember a case of tuberculous meningitis which I have seen in recent years in which the tubercle bacillus could not be demonstrated, although sometimes it took a considerable time to do it. The cells present are lymphocytes, which form about 95 per cent. or more of those seen. The reaction for albumin and globulin are more marked, very much more marked than the reaction seen in poliomyelitis. In about 25 per cent. of the cases Fehling's solution is not reduced. Animal inoculations (guinea-pigs) show tuberculosis in about four weeks' time.

In cerebrospinal fever the pressure of the fluid is definitely increased, and the amount very much, as in tuberculous meningitis. The fluid is turbid or cloudy, and stained specimens show the presence of the meningococcus. The cells present are polymorphonuclears up to 98 per cent. The albumin and globulin reactions are as in tuberculous meningitis, and Fehling's solution may or may not be reduced. In meningitis due to other organisms the fluid is increased, is turbid or cloudy, and otherwise resembles that of cerebrospinal fever except that the organism demonstrated in the smears will be found to be a pneumococcus or influenza bacillus or whatever happens to be the cause of the inflammation.

Diagnosis. The diagnosis of poliomyelitis presents certain difficulties, the commonest of which are in the cases in the preparalytic stage. If it is borne in mind that the disease may be regarded as a general infection and that various parts of the body may be affected, one understands more readily the rather protean symptomatology of the disease. At the present time the most important thing to confirm the diagnosis is the examination of the cerebrospinal fluid, and abortive cases showing a normal fluid must therefore remain more or less doubtful. The question of whether the child may have

poliomyelitis without having any changes in the cerebrospinal fluid is at present an open one. The general rule is if a case shows a normal spinal fluid that it is not to be regarded as poliomyelitis. Usually when there are any symptoms whatever of involvement of the nervous system the case turns out to be one of poliomyelitis. One sees a patient occasionally, particularly in association with other cases in the same family, in which the cerebrospinal fluid is normal, but in which the patient was strongly suspected of having the disease. This point might possibly be cleared up by a series of observations upon animals.

Another method of diagnosis which has been employed, but which is not suited for ordinary use, is to take the serum from the suspected case, mix it with a fatal dose of the virus, and after incubating it inject it intracerebrally into monkeys. A failure to develop the disease would indicate that the virus had been neutralized, but it must be borne in mind that serum from persons having had the disease recently will also neutralize the fluid, and if the individual had passed through an unrecognized abortive attack the results could well be misleading.

The diagnosis of the paralysis itself is not always easy. In older children it is usually apparent and the child will tell you he cannot make certain movements if asked to do so, unless he is too ill to take notice. In the very sick and the very young the production of pain or tickling must be used and the unparalyzed member will be used to protect the paralyzed one or to brush away the source of the irritation. In young babies picking up the child with the hands under the shoulders and buttocks, leaving the limbs free, will usually make the paralyzed parts plain. The normal infant moves all its members, in the paralyzed the affected part hangs in marked contrast with the moving arms or legs. In very ill children this is not as effective, but still of value.

Before the onset of the paralysis, or when it is unrecognized, the case may be mistaken for almost any acute febrile disturbance, and great care should be taken to elicit changes in the nervous system. In the presence of an epidemic even comparatively slight changes may be sufficient evidence on which to do a lumbar puncture, and most parents will welcome any method which abridges their suspense. The most common sources of error, apart from conditions with nervous symptoms, are as follows:

Croup or Laryngitis. With a paralysis of the laryngeal muscles the case may present such dyspnea as to require intubation and the child may be suspected of having croup, laryngitis, or laryngeal diphtheria. Other paralyses will generally be found on careful examination and the absence of any other evidence of diphtheria will generally make the case clear.

Bronchopneumonia. A child with a paralysis of the respiratory muscles may suggest a pneumonia. On careful examination either

the thoracic muscles or the diaphragm will be found paralyzed. The fixed chest wall, either one or both sides with exaggerated abdominal breathing, characterizes the first. When the diaphragm is paralyzed, instead of inspiratory distention of the abdomen there is an inspiratory retraction. With hurried respiration and a little bronchitis or pulmonary edema the physical signs may be misleading unless one is unusually skilled, and even then.

Nephritis with Uremia. This may be misleading on account of the convulsions or coma. The edema and urinary findings will be sufficient to clear up the diagnosis, or a lumbar puncture may be done.

Acidosis. Cyclic Vomiting. This may be very misleading. The profound languor may suggest a generalized slight loss of power, such as is sometimes seen. There may be twitching of the muscles and other nervous symptoms. The acetone odor of the breath and the marked diacetic reaction in the urine will point the way. The reaction in ordinary febrile disturbances is rarely as pronounced as in acidosis. A lumbar puncture may be needed.

Diarrhea. When the symptoms of gastro-intestinal disturbances are very marked the diagnosis may not even be suspected, inasmuch as meningismus and other nervous symptoms are not uncommon in connection with diarrhea. The lumbar puncture will afford a means of settling the question in suspected cases.

One should bear in mind that poliomyelitis may coexist with other diseases and with injuries. A surgeon recently told me of a case occurring in a boy with a broken arm. A couple of weeks after the arm had been put up it became very painful, and there was a slight fever. It turned out to be a poliomyelitis. The disease complicating medical conditions is readily imagined and needs no further detail.

A second class of disease in which there is pseudoparalysis or spasm may also cause difficulty in diagnosis. This includes scurvy, rickets, hysteria, the spasmophilia seen in nutritional disturbances, and tetany.

Scurvy. In severe scurvy the child assumes a position which suggests poliomyelitis. The paralysis is only apparent and the child can be made to move the extremities if sufficiently irritated. In the very late cases the muscles will be seen to move if the limbs do not. The reflexes are normal. There are, in addition, the classic signs, the bleeding of the gums, the submucous and subdermal hemorrhages, the periosteal swellings, etc., and symptoms rapidly disappear on the administration of orange juice.

Rickets. In acute rickets there is a pseudoparalysis like that described in scurvy, but in place of the scorbutic symptoms there are marked evidences of rickets.

Tetany. The characteristic position, the spasm being chiefly in the hands and feet and bilateral, the exaggerated reflexes, the

contraction of the muscles on percussing the nerve, best seen in the facial, and the spasm caused by constricting a limb make the diagnosis easy.

Spasmophilia. Apart from tetany a definite tendency to contraction of the muscles exists in certain poorly nourished young infants. The reflexes are increased and the stiffness of the muscles is general.

Hysteria. This may present some real difficulties. Fortunately it is rare in older and practically absent in young children. The reflexes are normal and there are sensory disturbances, usually anesthesia of the glove and stocking type. If the condition has existed for some time the absence of marked atrophy is of value.

The third class of cases includes those in which there is some definite disease of the nervous system. To avoid repetition *let me insist upon the necessity of obtaining the history of the attack.* This will save many embarrassments and will also eliminate the congenital conditions. The history may be impossible or difficult to get or may be misleading, but usually it will help tremendously.

In this connection one must bear in mind the possibility of encountering an old poliomyelitis with some intercurrent fever added. We are dealing only with the diagnosis in the acute stage or near it, so that the differential diagnosis between the old nervous lesions will not be touched on.

In the following diseases *the examination of the cerebrospinal fluid is the deciding point.*

Tuberculous Meningitis. This may give more difficulty than any other condition. The general appearance, as a rule, is different, but this may not mean much until the child has been seen several times. The cerebrospinal fluid is under greater pressure than in poliomyelitis. Sooner or later there are changes in the eye-grounds. The onset is more slow and more irregular. The dominant symptoms are drowsiness, vomiting, irregular pulse and respiration, convulsions, and rigidity of the muscles. The reflexes are increased. In poliomyelitis the length of time to reach the same stage is much more brief, and while in the incubation stage there may be rigidity or increased reflexes the tendency is to become flaccid and to have a loss of reflexes.

Cerebrospinal Fever. At the onset the two diseases may be strikingly alike. The sudden onset with vomiting and high fever, the prostration and rigidity of neck and extremities, the drowsiness with irritability and hyperesthesia, may be simulated by poliomyelitis. The petechial eruption, if present, is a help, and after a few days the marked spasticity and increased reflexes give a picture usually easy to distinguish.

Other Forms of Meningitis. Much as above, the diagnosis depending on finding the causal organisms in the cerebrospinal fluid.

Meningismus. Meningeal symptoms, drowsiness, retraction of the head, etc., may be seen in connection with inflammatory diseases

of the body elsewhere, as in pneumonia and enterocolitis. This may be intensified by a great loss of fluid from the body, as in the last-named disease. These conditions may tax the diagnostic powers if only the symptoms and physical signs are depended upon. The recognition of the existing disease and the cerebrospinal fluid clear up any doubts.

Cerebral Thrombosis. This is seen in connection with inflammatory diseases elsewhere in the body, and the diagnosis may not be suspected. If symptoms are produced that stand out above those of the causative condition they are convulsions and paralysis, either localized or general, strabismus, and coma. When the disease extends from a neighboring inflammation, as in the nose or ear, the symptoms may be more marked, and consist of headache, drowsiness, and if pyemia occurs, chills, sweats, and a high variable temperature. I have seen one instance of a lateral sinus thrombosis in which the drowsiness and irritability were not unsuggestive of poliomyelitis. The localizing symptoms, cyanosis of the face with dilatation of the temporal and frontal veins in thrombosis of the longitudinal sinus, the marked edema of eyelids and face and protrusion of the eye in cavernous thrombosis, and the extension into the neck in lateral sinus trouble soon make the diagnosis plain.

Mental Deficiency. When there is some febrile disturbance this has more than once been mistaken for poliomyelitis. The history, if obtainable, and the subsequent history, if not, will generally make the question clear, and one can always resort to a lumbar puncture. I have seen some extraordinary clinical pictures when the two were associated.

Amaurotic Family Idiocy. Tay-Sachs's Disease. This, too, can be mistaken if there is an intercurrent fever, as the flaccidity suggests poliomyelitis. The condition affects all the muscles, the blindness is apparent, and there are characteristic changes in the eye-grounds. It occurs in Jews, and the history of gradual onset, beginning between the third and sixth month, is usually obtainable.

Transverse Myelitis. This may occur in connection with the acute infectious diseases. The increased reflexes below the lesion and the involvement of bladder and bowels ought to make the diagnosis easy.

Pott's Disease. By pressure this may cause a paralysis with increased reflexes. The diagnosis is usually apparent, but cases have been sent to hospitals as poliomyelitis.

Congenital Spastic Paralysis. Despite the fact that these do not resemble acute poliomyelitis they have been mistaken for it. The differential diagnosis of late poliomyelitis and these cases is another story.

Chorea. This disease has also been mistaken for poliomyelitis, but ordinary careful examination ought to solve the difficulty.

Facial Paralysis. Bell's Palsy. In times of epidemic this may give considerable difficulty. In doubtful cases the only way to

clear up the diagnosis is by lumbar puncture, but a facial paralysis coming on after definite exposure to cold and preceded by earache is apt to be called Bell's palsy, and the same is true of cases in which there is marked involvement of the ear. On the other hand, a case coming on with a history similar to poliomyelitis can fairly safely be classed as that disease.

Peripheral Neuritis. Cases of this disease may cause very distinct difficulties in diagnosis. In children it usually follows an infectious disease. It is most common after diphtheria, and there is usually a history of throat involvement. The most common forms of paralysis are those of the soft palate and of the eye muscles, particularly of the accommodation. The patient often shows irregular heart action with dilatation of the heart. In poliomyelitis the paralysis comes on within a few days, usually within the first eight days. In diphtheritic paralysis the onset is later. In Rolleston's series, on which I commented in *Progressive Medicine* for March, 1914, the only forms of paralysis which occurred during the first two weeks were those involving the palate and the so-called cardiac paralysis. The ocular paralyses are more apt to occur during the fourth and fifth week, although some occur in the third week, and paralysis involving the lips, pharynx, or diaphragm almost always occurs later than this, that is, during the sixth, seventh, and eighth week. In cases seen early a lumbar puncture will settle the question, but in cases occurring late in which no history can be obtained the difficulties of diagnosis may be almost insurmountable.

THE CLINICAL ASPECTS AND TREATMENT OF ACUTE POLIOMYELITIS.

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The epidemic of acute poliomyelitis occurring during 1916 has produced an infinitely larger number of cases than during any preceding epidemic. Up to December 1, 1916, there were 999 cases in Philadelphia, 768 of which were treated at the Philadelphia Hospital for Contagious Diseases, and it is mainly upon the study of these latter that this paper is based.

It has been brought out very forcibly that, while belonging to the acute infectious diseases, it is a general disease in which almost all the organs of the body are involved. This has been proved conclusively by postmortem findings and by experimental work, showing that a solution made from these organs when injected into monkeys has caused typical acute poliomyelitis, which strengthens our belief that the principal mode of entrance in the human being

is through the gastro-intestinal tract. The organs in which the most marked lesions are found are the gastro-intestinal tract, liver, spleen, lymphatic glands, and lungs in addition to the well-known changes in the spinal cord. It is important for us to recognize these facts early, as they assist materially in making a diagnosis during the preparalytic stage. The older writers have laid much stress upon the natural immunity which most children possess. This apparently has either decreased to a great extent or, what is more likely, the disease has not been recognized in large numbers of children who have had it only in the preparalytic stage, or, in other words, have had the general symptoms without the special spinal manifestations. The surroundings and general condition of children seem to play an unimportant part in this disease, as the best cared for and healthiest children suffer quite as frequently as those living under the poorest hygienic surroundings in the most overcrowded parts of the community. While it is distinctly a disease of early childhood, over 80 per cent. of cases occurring under five years of age, it is found with diminishing frequency up to sixteen years, after which age about 1.5 per cent. of cases occur.

During the time elapsing from the appearance of the first symptom until paralysis occurs there are many important and interesting facts to be discovered; in the first place the duration of the preparalytic stage varies from twenty-four hours to twelve days. In the larger number, however, the first signs of paralysis develop during the first or second day. Invariably the first symptom noticed by the parents has been the presence of fever, ranging from 102° F. to 105° F.; the temperature, while not remaining so elevated, continues above normal for from seven to ten days, or, in other words, into the paralytic stage, both pulse and respiration being markedly increased, and as the temperature lessens they still remain much above normal, the pulse varying from 120 to 160 and the respirations from 30 to 60. Constipation is the next symptom most frequently present, and while, as a rule, it is only slight in character, it indicates an intestinal derangement. In older children this is frequently accompanied by abdominal pain, at times so severe and so localized that appendicitis has been diagnosed. Vomiting as an early symptom occurs only less frequently than constipation, and in older children is associated with nausea and headache. In a very small percentage of cases a slight diarrhea has been noticed, while in only two cases was a severe enteritis present during this period. Irritability and restlessness or fretfulness often occur, while drowsiness or even stupor appears in a moderately large number. These cases, however, are easily aroused, and if old enough will answer questions intelligently. In the rachitic type of child we find a few in which convulsions occur, but even here not with the frequency to be expected in a disease causing so much general and local disturbance. Pain and rigidity in the muscles of the neck are noted in over half of the cases. This is seen on bending the child's head

forward. It may be present from the first day or may not develop until just before the onset of other paralyses. An interesting and suggestive symptom seen occasionally, but not with great frequency, is that of muscle tremor. This may be local or general, in some cases the entire body showing the effect of this condition. As a rule, one finds the patellar reflex either lost or greatly diminished during the preparalytic stage, while in a few instances exaggeration of the patellar reflex has been found.

The severity of the symptoms at this time has apparently no bearing upon the degree or extent of the ensuing paralysis.

In the abortive type of cases, or those which never pass beyond the preparalytic stage, we frequently find extremely severe symptoms; that is to say, they will run a temperature of the highest type, ranging from 104° F. to 105° F., while the pulse-rate will be between 140 and 180, the respirations from 50 to 80, vomiting more acute and frequent in occurrence, while the constipation is marked, in some cases even leading one to suspect intestinal obstruction. Of course, there are many others of this same type who do not show such a marked clinical picture, giving only a slight rise in temperature, not over 101° F., but the pulse will invariably be much increased, 120 to 140, and respirations between 30 and 40. These cases will, as a rule, clear up within four to six days, leaving no paralysis or weakness of any set of muscles, and if it were not for the diagnostic aid of the lumbar puncture and the cell count therefrom many cases would not be correctly diagnosed. In fact, we feel assured that hundreds of such abortive cases have occurred not only in our city but wherever the epidemic has been in progress.

CASE I.—*Typical Abortive Case.*

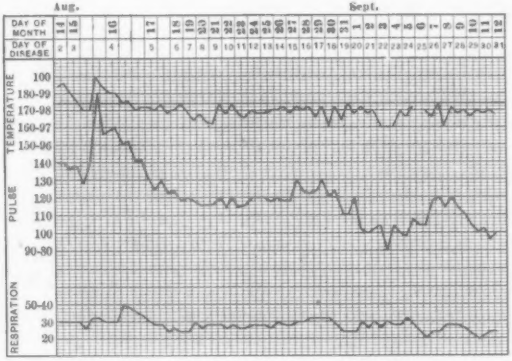
J. R. S.; male; aged five years. Seen in consultation with Dr. Elmer, of Wayne, October 2, 1916. Two days previously the child had abdominal pain and slight constipation. On the morning of October 1 the temperature was 103.4° F., pulse 144. In the evening of the same day the temperature was 105.8° F. The child complained of headache, was very quiet, and slept most of the time. The next morning he was stuporous, though answered questions when aroused. Temperature at that time was 105° F., pulse 144, respirations 42. There was rigidity of the neck, with pain on nodding motion. When seen at 11.30 P.M. the temperature was 101.8° F., pulse 140, and respirations 40. The knee-jerks were normal at 5.30 P.M., left knee-jerk absent at midnight. Right plantar was sluggish, Babinski on left, Kernig present on both sides. Lumbar puncture removed 37 c.c. of clear spinal fluid under greatly increased pressure, the cell count being 167 per cm. One-half cubic centimeter of adrenalin chloride was injected into the spinal canal.

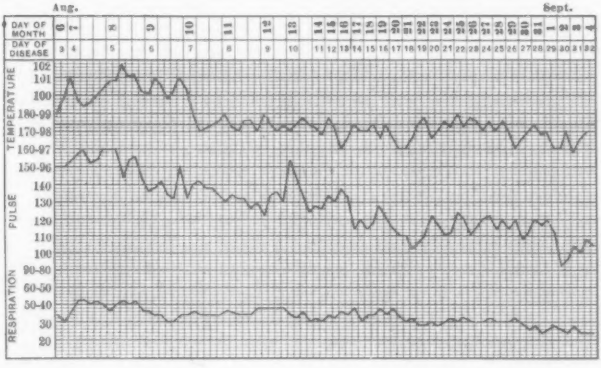
October 3. Improvement was marked. Temperature was normal; free action of both legs and knee-jerks were present. He was reported to have made an uneventful recovery without paralysis.

This case is peculiarly interesting, owing to the fact that ten days

previously a younger child developed similar symptoms with complete recovery within a few days.

It is difficult to define the length of the acute paralytic stage, as it varies so greatly in different individuals. The temperature, as a rule, becomes normal either with the onset of paralysis, or at least does not remain more than a degree elevated for two or three days, after which time it almost invariably runs a subnormal course for from one to three weeks. It seems that more reliance





must be put upon the clinical picture of the pulse and respiration in reaching some definite conclusion regarding the duration of the acute paralytic stage. We find that while there is a moderate variation in pulse and respiration it is rare to find both having reached normal within three weeks from the date of onset, while many will still show an increased rate up to five and six weeks, others having been removed from the hospital before the return to normal. The above charts show the typical course of the temperature, pulse, and respiration.

Pain is one of the conditions found with moderate frequency during this stage. It is especially referable to the hip-joint, and in the majority of cases is only present on motion; that is to say, when the child is lying quietly there is no pain, but as soon as the leg is moved the child cries out. In other cases pain may be referred to any of the affected parts, especially the shoulders, elbows, and back. Its duration is exceedingly variable; in some cases following lumbar puncture it disappears and does not return; in others it is relieved by lumbar puncture but returns within a few hours or days.

In other cases it may not be present for weeks, when suddenly pain and more or less weakness of the affected part are complained of. We have found that if lumbar puncture is immediately done the pain will be relieved in 90 per cent. of these cases.

As a rule the appetite of these children is unimpaired, though the power of digestion and assimilation are distinctly below par, and for that reason great care must be taken of their diet. Constipation is the rule and laxatives must be used with greater frequency than in other diseases.

While a study of the parts involved would be of much interest it is not possible to more than glance at a few of the important combinations. In 25 per cent. of all cases the legs, either one or both, were the only parts involved; in 12 per cent. the arms only, one or both, were affected; in only 4 per cent. was a true crossed paralysis found. Other combinations, including the face, eyes, neck, back, chest, abdomen, bladder, deglutition, and vocal cords, are so numerous and varied that it is impossible to include them in this paper. In only 2 per cent. of the cases have we found the bladder to have been involved. It usually occurred between the second and fifth day of the paralysis, and lasts, as a rule, for from a few hours to forty-eight hours. Older children complained of pain from the distended bladder, while in the younger children it was only found on examination. This condition cleared up rapidly, usually without catheterization, and without leaving any cystitis.

In many of the severe cases which were brought to the hospital on the first or second day of the acute paralytic stage, progressive paralysis was noted, some presenting the typical picture of ascending or Landry's paralysis; others progressed in an extremely irregular manner, this latter form being the most common. Some cases progressed with such rapidity that within twelve hours all extremities —neck, back, chest, and abdomen—were involved, death resulting within a few hours or in from one to three days. Others were much slower, the period of progression lasting six to seven days.

CASE II.—*Progressive Paralysis.*

E. B.; male; aged two years. Admitted to hospital September 2, 1916 with the following history: Illness began August 30, with fever, backache, and constipation. Paralysis developed August 31. Examination showed rigidity of the neck; good chest expan-

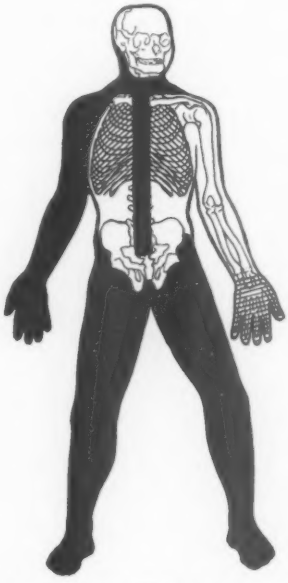
sion; arms normal; complete paralysis of both lets; knee-jerks absent; plantar reflexes sluggish. Lumbar puncture gave 20 c.c. of clear fluid; cell count, 110 per cm.

September 3. There was complete paralysis of the vocal cords.

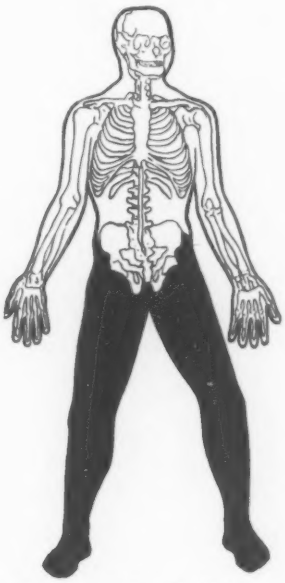
September 4. There was paralysis of the muscles of the back and of the right arm, with weakness of the left hand; 15 c.c. of immune serum was given intraspinally following lumbar puncture.

September 5. Ten cubic centimeters of immune serum was given intravenously.

September 6. Chest expansion limited. Lumbar puncture gave 20 c.c. clear fluid; 10 c.c. immune serum was given intraspinally.



CASE II.—E. B. Height of paralysis.



CASE II.—E. B. On discharge.

September 7. Paralysis of vocal cords had disappeared.

September 11. General condition was very much improved; rigidity of neck and back had disappeared.

September 14. Chest expansion was normal.

September 21. It was noted that his condition was still very weak and there had been no change in the paralysis since September 14.

September 23. Eighteen cubic centimeters of clear fluid was removed by lumbar puncture under moderate pressure.

September 24. Twenty-five cubic centimeters of clear fluid was removed by lumbar puncture under increased pressure.

September 25. Lumbar puncture; 30 c.c. of clear fluid removed under much increased pressure.

September 27. Lumbar puncture; 20 c.c. of clear fluid removed under normal pressure.

Upon leaving the hospital September 30 the child had flaccid paralysis of both legs, but the neck, vocal cords, back, chest, right arm, and left hand had cleared up.

This case shows clearly the type of advancing paralysis in a very severe case, with good result following the use of immune serum intraspinally and intravenously.

The severe toxic variety appeared with greater frequency than in other epidemics, some having comparatively little paralysis while others were paralyzed to a marked degree. In several instances a typical picture of acidosis was presented.

Chart of Case III.—S. H.

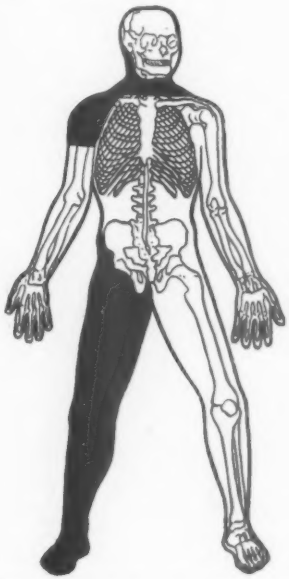
Case III.—*Progressive Paralysis with Toxemia.*

S. H.; male; aged eight months; breast-fed; mother accompanying child to hospital. History of fever and vomiting beginning October 23, 1916; onset of paralysis October 25. Upon admission to hospital October 27 the child showed marked toxemia associated with weak heart action; paralysis of neck; partial paralysis of muscles of deglutition; paralysis of vocal cords; intercostal muscles; respiratory movements, abdominal in character; paralysis of right shoulder and right leg; marked weakness in left leg. Knee-jerks on both sides absent; plantar reflexes present. Lumbar puncture gave 20 c.c. of clear fluid under increased pressure; 1 c.c. of adrenalin chloride was injected intraspinally.

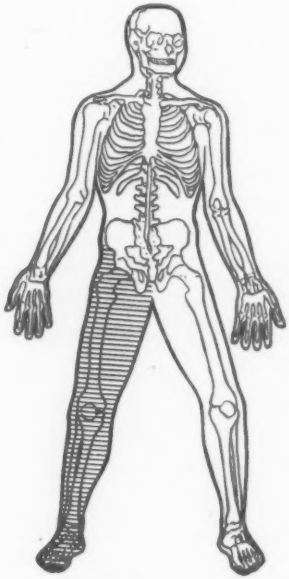
October 28. Lumbar puncture; 15 c.c. of clear fluid followed by blood-tinged fluid under moderately increased pressure. Cell count of the clear fluid 25 per cm.; 10 c.c. of immune serum injected intraspinally.

October 29. Heart action improved; general condition better; less toxic. Lumbar puncture; 15 c.c. of blood-tinged fluid under increased pressure; 1 c.c. of adrenalin chloride injected intraspinally.

October 30. Lumbar puncture; 15 c.c. of clear fluid under increased pressure.



CASE III.—S. H. On admission.



CASE III.—S. H. On discharge.

October 31. General condition much improved. Some chest expansion. Lumbar puncture; 15 c.c. of clear fluid under pressure; cell count 50 per cm.

November 11. Lumbar puncture; 30 c.c. of clear fluid under much increased pressure; cell count, 25 per cm.

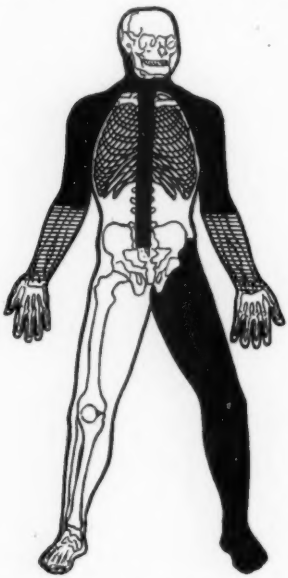
November 8. Movement of right shoulder normal; vocal cords and deglutition normal; movements of feet are stronger.

Upon discharge from the hospital, November 26, it was noted that all paralyses had cleared up with the exception of slight weakness in the right leg.

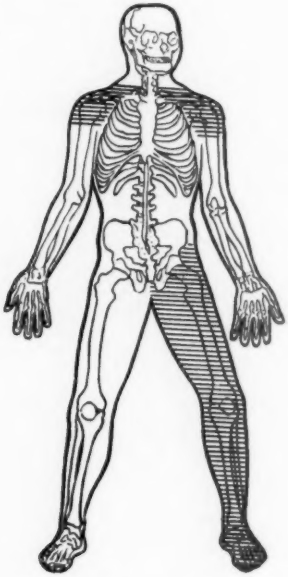
CASE IV.—*General Toxemia and Severe Paralysis.*

E. F.; male; aged nineteen years. Illness began October 14, 1916, with fever, constipation, vomiting, headache, followed the

next day by stiffness and pain in the muscles of the neck. Paralysis developed on October 17, the day of admission to the hospital. Examination showed stiffness of the neck and back; impaired chest expansion; flaccid paralysis of both shoulders and upper arms, with weakness of forearms; left leg completely paralyzed. Knee-jerk and plantar reflex absent on the left side, present on right. Toxemia marked; heart action poor. Lumbar puncture; 30 c.c. of clear fluid removed under increased pressure; cell count, 89 per cm.; 3 c.c. of adrenalin chloride injected intraspinally.



CASE IV.—E. F. On admission.



CASE IV.—E. F. On discharge.

October 18. Owing to toxemia, 10 c.c. hyperisotonic salt solution was injected intravenously at noon.

At 6 P.M. lumbar puncture; 30 c.c. of clear fluid removed; cell count 40 per cm.; 2 c.c. of adrenalin chloride injected intraspinally. Mildly delirious most of the time.

October 19. Noon. Eight cubic centimeters of blood removed and 10 c.c. of hyperisotonic salt solution given intravenously.

October 20. A.M. Lumbar puncture; 25 c.c. of clear fluid removed under pressure; cell count, 56 per cm.

At noon 10 c.c. of blood withdrawn and 10 c.c. hyperisotonic salt solution injected intravenously.

October 21. General condition continues the same; chest expansion not so good.

At noon 4 c.c. of blood withdrawn and 7 c.c. of hyperisotonic salt solution given intravenously.

October 22. Lumbar puncture; 22 c.c. of clear fluid removed under pressure; cell count, 53 per cm.

October 24. Lumbar puncture; 8 c.c. of blood-tinged fluid removed under pressure.

October 25. General condition much improved. Mind perfectly clear for the first time; chest expansion better.

October 26. On account of restlessness, lumbar puncture was done; 25 c.c. of clear fluid was removed under slight pressure; cell count 30 per cm.; 14 c.c. of immune serum injected intraspinally.

October 27. Chest expansion still improving; right shoulder, complete flaccid paralysis; right leg normal; left leg can flex but not extend or lift leg from bed. Kernig's sign present on both sides. Lumbar puncture; 30 c.c. of straw-colored fluid removed under pressure; cell count 100 per cm.

October 29. Lumbar puncture; 30 c.c. of clear fluid removed under pressure; cell count, 60 per cm.

Condition steadily improved until November 22, when he was decidedly irritable and complained of pain in the left elbow and shoulder, with inability to move it. Lumbar puncture was immediately done, removing 15 c.c. of clear fluid under increased pressure; cell count, 5. All symptoms cleared up within two to three hours.

When discharged from hospital, December 2, he showed normal condition of neck and back, almost complete chest expansion, normal motion of forearms and arms, slight weakness in both shoulders, left leg normal, motion in all directions but too weak to stand upon it. As this patient was in the hospital until the fifty-second day of the disease it was interesting to note the lessening of the paralysis and the marked regain in muscle power.

These two cases show clinically the toxemia which frequently occurs as part of the disease and also the severer type of paralysis, with recovery.

The most important complications were those pertaining to the gastro-intestinal tract, and here in bottle-fed babies difficulties quite frequently arose; while in the forty breast-fed babies which were treated in the hospital, the mother accompanying the child, there was practically no digestive disturbance and the death-rate was lower. Bronchitis was next in frequency as a complication, seen with greatest severity in cases with intercostal paralysis, bronchopneumonia occurring occasionally. Otitis media occurred as a complication in a small number of cases. It was rather remarkable that there were practically no complications due to nose and throat conditions. Repeated examinations of them revealed nothing abnormal. Diphtheria occurred in only three cases, but as the Schick test was always employed and antitoxin administered when

the reaction was positive, this will account for the small percentage of cases developing.

The diagnosis of this disease is of extreme importance, especially in the preparalytic stage, when, as a rule, it is most difficult. In this stage in cases presenting severe symptoms, such as high fever, rapid pulse, and respiration without any physical signs to account for them, a diagnosis of poliomyelitis can be safely made in most instances, but should always be confirmed by lumbar puncture and cell count of the spinal fluid, this being the only accurate diagnostic measure. Many cases, however, present pain and stiffness in the neck as well as muscle twitching, and here the diagnosis is readily made. The quantity of fluid obtained by lumbar puncture varies considerably, a small quantity being 10 c.c., while frequently 20 to 30 c.c., and in some cases as much as 50 c.c. is readily obtained. The fluid is crystal clear, and for the most part is under increased pressure, varying from rapid drops to a stream squirting out one or two feet from the patient. When possible the counting of the cells should be done at once, using the ordinary blood chamber and counting the leukocytes in ten squares, thus obtaining the number of cells per cm. It varies greatly in different cases, and at times in the same case when counted on different days. It is safe to say that a cell count over 15 and under 600 would make our diagnosis positive.

The treatment during the preparalytic stage is that of any acute illness plus isolation; a cathartic, rest in bed, fresh air, and care of diet. Lumbar puncture should be used not only for its diagnostic value but also as a therapeutic measure. It removes the excess of fluid from the spinal canal, thereby relieving pressure upon the cord. Adrenalin chloride has been used with apparent success at this time by injection into the spinal canal, following lumbar puncture, of from 1 to 2 c.c., depending upon the age of the child. Following its administration the buttocks should be kept elevated. If immune serum be available its use at this time would certainly seem more potentially effective. Since the great majority of our cases were not seen until paralysis had developed no definite conclusions can be reached regarding the value of serum during the preparalytic stage.

The care of the child during the acute paralytic stage is of even greater importance than in the preparalytic. Here, rest and quiet should be enforced, the child, however, not being allowed to remain too long in one position but moved from side to side and kept as comfortable as possible, as change in position lessens the probability of the development of pressure sores. Noise irritates and should therefore be avoided. Plenty of fresh air, but not too much direct sunlight, is essential. Hot baths, even during the early days, when moving the child to the bath-tub does not cause too much pain, improve the child's condition and at times relieve pain. Great care must be exercised in feeding, keeping up the nutrition to the point of tolerance without overfeeding, as digestion and assimilation are

in some cases greatly weakened. Pressure on the affected parts by bed-clothes is to be avoided by the use of cradles, and later light splints should be applied when early deformities appear.

While many drugs have been advocated and used there seems to be none which gives marked results. Hexamethylenamin was used in all cases during the first two and a half months of the epidemic without apparent result, and was then discontinued. Tincture of nucis vomicæ was used in many cases after the first week for its general tonic action without any bad effect, while in some cases the general condition of the patient improved. During the third and fourth week syrup of iodide of iron was used in a number of anemic children, with good result.

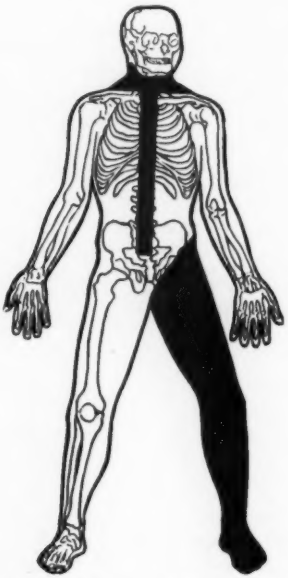
Lumbar puncture as a therapeutic measure must not be overlooked, as it is the one procedure from which is derived the greatest benefit. It should be done as often as the condition of the patient indicates; that is to say, from every twelve to every twenty-four hours in some cases; every three or four days in others, or only when increased pain and restlessness or irritability point to pressure by an increased amount of spinal fluid. By removing the pressure upon the congested portions of the cord we have seen cases recover from an apparent absolute paralysis of one or more extremities, which, of course, means there was only congestion and that the disease had not attacked or destroyed the nerve tracts. In other cases almost instant relief of pain followed lumbar puncture.

Adrenalin chloride in 1 to 1000 solution given intraspinally theoretically should be of great value because of its action upon the congested bloodvessels of the membranes and cord. Its use in doses of from 1 to 2 c.c. every six hours for several days has been advocated. This, however, we found caused marked disturbance, with vomiting in many cases, and every twelve to twenty-four hours was substituted. The results obtained were rather questionable, as it seemed impossible for the solution to reach the upper part of the cord if the seat of the lesion were high, even with the buttocks well elevated. This method of treatment, however, should not be given up until one showing decidedly better effect should be discovered.

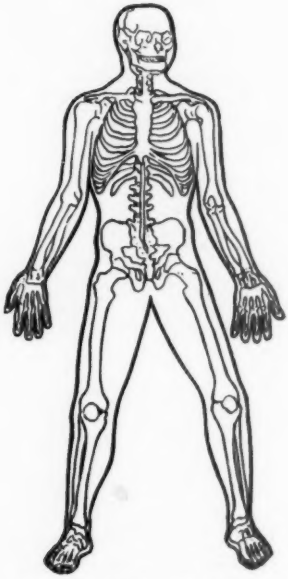
Normal human serum, that is, serum collected from healthy adults, was used in a few cases, but without result.

Immune serum, or that obtained from the blood of persons having suffered from acute poliomyelitis some months or years before, was used to as great an extent as possible. We were, however, handicapped by the comparatively small amount available, and by the fact that at first it was reserved for use in only the most desperate cases. Later on it was given to patients entering on the first or second day of the acute paralytic stage, and here some good resulted. It was given in doses ranging from 5 to 15 or even 30 c.c., either intraspinally, intravenously, or intramuscularly, daily or every two or three days for several doses. At times a combination of adrenalin

chloride in the morning and immune serum at night was used on consecutive days, with apparently better results than when given alone. In at least two very severe cases with chest involvement the improvement following this method of treatment was most marked. When, however, a severe toxemia is present, showing a marked general involvement, the intravenous use of the serum is especially indicated. When paralysis alone occurs the intraspinal method of administration seems to be most effective. The intramuscular method, I believe, should only be employed when it is impossible to give the serum into a vein, as the absorption is much slower. Another method of procedure when the toxemia is marked is the intravenous use of a hyperisotonic salt solution, following the removal of an equal or smaller quantity of blood; the quantity removed varying from 5 to 30 c.c., depending upon the age and condition of the patient.



CASE V.—L. K. On admission.



CASE V.—L. K. On discharge.

CASE V.—*Treatment with Adrenalin Chloride.*

L. K., Jr.; male; aged four years; admitted to hospital September 29, 1916, giving the following history (brother, aged two years, admitted same day): Began September 25 with fever, nausea, vomiting, headache, and convulsions. Paralysis developed on the day of admission. Examination showed neck and back rigid, left leg complete flaccid paralysis, knee-jerk absent, plantar reflex

present. Lumbar puncture gave 40 c.c. of clear fluid under much increased pressure; cell count 19 per cm.

September 30. Lumbar puncture; 5 c.c. of clear fluid under normal pressure; cell count 50 per cm.; 2 c.c. of adrenalin chloride injected intraspinally.

October 10. A.M. Lumbar puncture gave 12 c.c. of clear fluid; pressure moderate; cell count 30 per cm.; 2 c.c. of adrenalin chloride injected intraspinally.

P.M. Lumbar puncture gave 1 c.c. of clear fluid; normal pressure; 2 c.c. of adrenalin chloride injected intraspinally.

October 3. Good movement in toes and ankle-joint of left leg. Can flex but not extend it.

A.M. Lumbar puncture; 2 c.c. of clear fluid; pressure normal; 2 c.c. of adrenalin chloride injected intraspinally.

P.M. Lumbar puncture; 20 c.c. of clear fluid; pressure slightly increased; cell 30 per cm.; 2 c.c. of adrenalin chloride injected intraspinally.

October 4. P.M. Lumbar puncture gave 10 c.c. of clear fluid; pressure slightly increased; cell count 15 per cm.; 2 c.c. of adrenalin chloride injected intraspinally.

October 5. General condition good. Flexion but no extension of left leg; back and neck normal. Cannot bear weight on leg.

October 10. Can flex and extend left leg and also bear some weight when standing.

October 12. Can move left leg in all directions and stand with support.

October 15. Can bear weight of body on leg without support.

When discharged October 29, could stand and walk; simply slight weakness in left leg; knee-jerk still absent. Neck and back normal.

In this case the injections of adrenalin chloride were undoubtedly beneficial.

CASE VI.—*Severe Type of Paralysis Treated with Immune Serum.*

F. R.; female; aged three years; admitted to hospital, October 7, 1916, with the following history: Illness began October 4 with fever, constipation, and twitching of muscles of right arm. Paralysis noted October 6. Examination on admission showed flaccid paralysis of neck and back; right shoulder completely paralyzed; left shoulder and arm complete paralysis; right leg weak; left leg normal; knee-jerks absent in both; plantar reflex present. Lumbar puncture gave 20 c.c. of clear fluid under moderately increased pressure; cell count 23 per cm.; 2 c.c. of adrenalin chloride injected intraspinally.

October 8. Child became toxic. Lumbar puncture gave 5 c.c. of blood-tinged fluid under normal pressure.

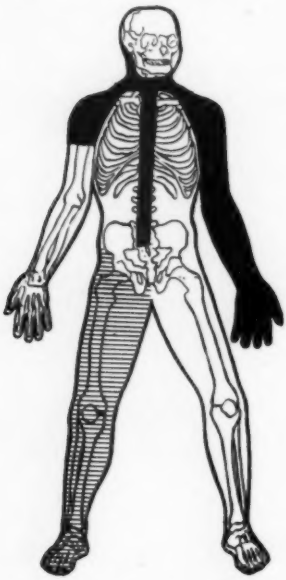
October 9. A.M. Three cubic centimeters of hyperisotonic salt solution injected into left external jugular vein.

P.M. Lumbar puncture gave 25 c.c. of clear fluid under increased pressure; cell count 20 per cm.; 15 c.c. of immune serum injected intraspinally.

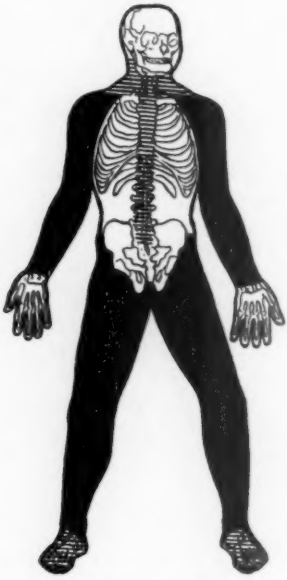
October 10. Chest expansion limited. Motion only in fingers; none in legs; Kernig's sign present.

October 13. General condition improved. Lumbar puncture gave 12 c.c. of clear fluid under greatly increased pressure; cell count, 40 per cm.

October 14. Complete flaccid paralysis of neck and arms, except for slight motion in fingers and legs.



CASE VI.—F. R. On admission.



CASE VI.—F. R. On discharge.

October 17. Motion in toes; chest expansion normal. Lumbar puncture gave 8 c.c. of clear fluid under normal pressure; cell count 16 per cm. Splints applied to legs.

October 19. Two cubic centimeters of hyperisotonic salt solution injected into the veins of the right foot.

October 20. Lumbar puncture gave 12 c.c. of blood-tinged fluid under much increased pressure.

October 21. General condition good. Slight motion in left leg.

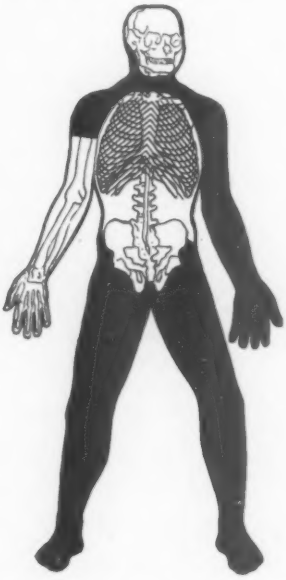
October 27. Neck muscles stronger; right arm movements in fingers and forearm. Slight bronchitis developed.

November 3. Bronchitis better. General condition good. Motion in both hands and wrists.

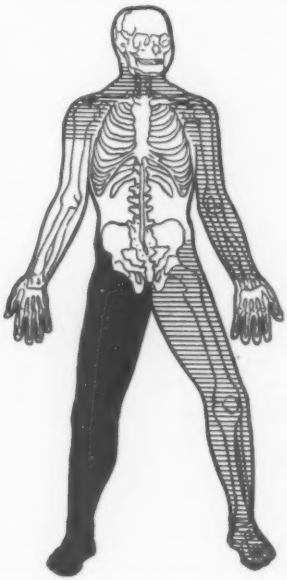
November 6. Lumbar punture gave 15 c.c. of blood-tinged fluid under moderately increased pressure.

When discharged November 8, she had moderate control of neck and back. Shoulders and arms showed complete flaccid paralysis, motion only in hands; legs complete flaccid paralysis with motion in toes.

CASE VII.—*Severe Type of Paralysis Treated with Immune Serum.* H. R.; female; aged two and one-half years; admitted to hospital September 20, 1916. History of fever, constipation, vomiting, and headache beginning September 16. Onset of paralysis September 18.



CASE VII.—H. R. On admission.



CASE VII.—H. R. On discharge.

Examination on admission showed paralysis of neck, chest, right shoulder, complete of left arm and of both legs. Knee-jerks absent; plantars present. Lumbar puncture gave 30 c.c. of clear fluid under increased pressure; celi count, 100 per cm.; 10 c.c. of immune serum injected intraspinally.

September 21. Right arm paralyzed; pain general. Condition very poor. Lumbar puncture gave 30 c.c. of clear fluid under pressure; 10 c.c. of immune serum injected intraspinally.

September 22. Lumbar puncture gave 8 c.c. of blood-tinged fluid; 5 c.c. of immune serum injected intraspinally.

September 23. Lumbar puncture; 10 c.c. of blood-tinged fluid removed under increased pressure.

September 24. Lumbar puncture; 15 c.c. of clear fluid removed under increased pressure; cell count 23 per cm.

September 26. Lumbar pucture gave 18 c.c. of clear fluid under slightly increased pressure; cell count, 33 per cm.; 7 c.c. of immune serum injected intraspinally.

September 29. Both forearms show limited movement. Slight vaginitis developed.

October 2. Lumbar puncture gave 8 c.c. of clear fluid under increased pressure; cell count, 24 per cm.

October 3. General condition much improved. Chest expansion much better on left side.

The general condition of the patient improved gradually, with better chest expansion, until she was discharged October 30, when she had fair movements in both arms, poor in shoulders; flaccid paralysis of right leg; slight motion of left leg; knee-jerk still absent; neck and back weak; chest muscles almost normal.

Case VI shows a severe type of paralysis, with toxemia improving to a certain extent by the use of immune serum. She undoubtedly would not have lived without its use, as she was in a desperate condition on admission.

Case VII was a still more severe type of paralysis when immune serum was used from the first, undoubtedly saving the child's life and at least assisting in the improvement of the paralyzed parts. Every child developing this type of paralysis before immune serum was used died, while it is safe to say that at least one-third lived where the serum was given.

CASE VIII.—*Treatment: Combination of Adrenalin Chloride and Immune Serum.*

O. S.; male; aged six months; admitted to hospital October 1, 1916. History of fever and constipation beginning on September 25. Said to be recovering from bronchopneumonia. Onset of paralysis September 29. Examination on admission showed paralysis of neck; slight paralysis of chest; lungs normal with the exception of harsh breath sounds; left shoulder paralyzed; right leg complete flaccid paralysis; left leg very limited movement; knee-jerks and plantar reflexes absent on both sides. Lumbar puncture gave 25 c.c. of clear fluid under markedly increased pressure cell count, 26 per cm.; 10 c.c. of immune serum was injected intraspinally.

October 2. A.M. Lumbar puncture followed by 2 c.c. of adrenalin chloride injected intraspinally.

P.M. Lumbar puncture gave 40 c.c. of clear fluid under increased pressure; 10 c.c. of immune serum injected intraspinally.

October 3. General condition good; left arm paralyzed, excepting left hand; legs show slight movement of toes.

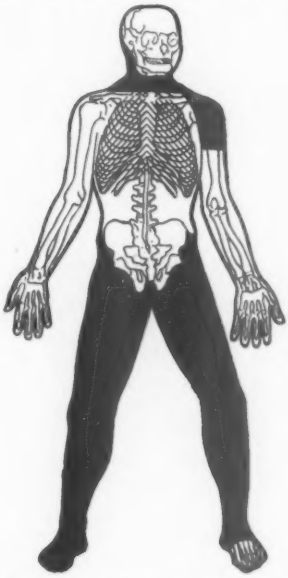
A.M. Lumbar puncture gave 25 c.c. of clear fluid; 2 c.c. of adrenalin chloride injected intraspinally.

P.M. Lumbar puncture removed 15 c.c. of turbid fluid; 15 c.c. of immune serum injected intraspinally.

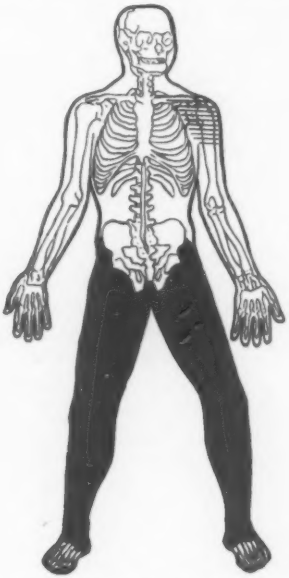
October 4. Left arm, good motion in forearm and fingers.

P.M. Lumbar puncture removed 10 c.c. of blood-tinged fluid under increased pressure; cell count 183 per cm.; 2 c.c. of adrenalin injected intraspinally.

Condition remained about the same until October 12, when a slight bronchitis developed. Movement of left forearm and fingers good. Right leg, complete flaccid paralysis; left leg, motion in toes.



CASE VIII.—O. S. On admission.



CASE VIII.—O. S. On discharge.

October 19. Bronchitis had cleared up. General condition good Neck only slightly weak; left arm showed slight motion in shoulder, good in forearm and fingers. Legs motion in toes only.

When discharged from the hospital November 2, neck was normal; left shoulder much stronger; could hold arm erect for a few moments; legs paralyzed except for slight motion of toes; chest expansion normal.

This child presented the most severe type of general paralysis, and without treatment would not have survived. The use of both immune serum and adrenalin chloride, we are convinced, were more efficacious than either one used alone. It is interesting to note that practically no severe reaction follows this method of treatment, with the possible exception when too large a dose of adrenalin

chloride is used. No marked changes in the temperature, pulse, or respiration were observed following the injections.

Since writing this paper an interesting epidemic in a private institution for feeble-minded children in a neighboring town has been brought to my notice. Thus far 5 cases have developed among the 12 inmates, with 1 death.

The first 3 cases were seen by me in consultation on December 9, 1916. The date of onset of the first case was November 21; the second November 28, and the third December 8. The fourth and fifth cases were seen December 15, having developed December 13 and 14 respectively. They are of interest from the fact that they are the only institutional cases to have developed during this epidemic in this section of the country, and further, that from the dates of onset it would appear that direct contact is clearly established as the source of infection, the only missing link being the source of infection in the first case.

Summarizing, it would appear to me that too little stress has been laid upon the abortive cases, many of which were never diagnosed, and it is to this cause that our high mortality rate of 29 per cent. can be attributed.

A further study of the gastro-intestinal lesions will, I feel sure, reveal the fact that this is one of the most important points of entrance for the infection.

Lumbar puncture, not alone for diagnosis but also as a therapeutic measure, must be borne more constantly in mind and used to an even greater extent. Adrenalin chloride and immune serum, either alone or in combination, is the most efficient treatment which has been evolved during this epidemic, and should be used whenever possible, only remembering, as in the case of diphtheria antitoxin, that the most beneficial results are obtained from its early use.

An interesting fact brought out in those cases detained in the hospital after the regular period of quarantine had expired, owing to pneumonia or vaginitis, has been the improvement in the parts which were apparently completely paralyzed on the date on which these cases ordinarily would have been discharged.

In concluding, while some advance has been made in the method of treatment during the recent epidemic, there is still a large field for research, and until the laboratory comes to our aid with a true antitoxin for acute poliomyelitis the clinician will be forced to admit that our mortality rate will remain higher than necessary.

EPIDEMIC VAGINITIS IN CHILDREN.[1]

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It has long been the opinion of clinicians that the clinical and bacteriological methods ordinarily used for the differentiation of gonococcus from other forms of epidemic vaginitis have not been sufficiently perfected to make them absolutely reliable. The literature of this subject, including the "Report of the American Pediatric Society on Vaginitis in Childhood," which was made to this Society in 1915, indicates that the bacteriological technic of this disease involved in the accurate diagnosis of gonococcus vaginitis, must still further be improved and simplified before it can be absolutely relied upon for the accurate diagnosis of epidemic vaginitis in institutional and private practice.

There is perhaps little doubt in the minds of pediatricians, as well as bacteriologists, that a large percentage of these cases are due to the gonococcus, and there is also no question but that the bacteriological tests as now made as aids in the diagnosis of gonococcus vaginitis are essential and are of the greatest value, and that at the present time we must rely almost wholly upon these tests in making our diagnosis of this condition, but the fact remains that the routine staining method for the Gram-negative, intracellular, biscuit-shaped diplococcus, which is chiefly relied upon in making the diagnosis of this disease, is not altogether satisfactory.

Prevalence of Epidemic Vaginitis in Children. Vaginitis is now recognized as one of the most prevalent infections in most of our large cities. This is especially true in hospitals and other institutions which care for female children. At the present time there are about seventy-five of these cases being cared for by the Cincinnati Hospital and the Children's Clinic, which is run in coöperation with this hospital. Under careful treatment and rigid quarantine regulations the number of these cases in the Cincinnati Hospital and Clinic have very materially diminished during the past winter. It is a significant fact that the vast majority of our new cases come from other institutions, such as orphan asylums and children's homes, and that nearly all of these new cases occur in children under school age. My inference, therefore, is that the public schools of Cincinnati have very little, if anything, to do with the spread of this contagion.

The marked prevalence of this disease in most of our large cities, as well as its intractability to treatment and its defiance of ordinary quarantine regulations, is recognized as presenting one of the most

[1] Read before the American Pediatric Society, May 9, 1916.

difficult public health problems presented by any of the contagious diseases.

The collective report of the committee above referred to indicates that the disease is on the increase. We may, therefore, assume that epidemic vaginitis is a contagious disease very prevalent among female children in our large cities, and that the means now in vogue for the cure of this disease and for preventing its spread are quite unsatisfactory.

During the long experience which I have had with this disease in Cincinnati there has never been an instance in which the disease was contracted by adults, although these cases are constantly under the care of female nurses. In the report of the committee above referred to, "85 physicians have never known of an instance in which a nurse was infected during a ward epidemic of vaginitis, 10 physicians have seen such an occurrence." It appears from these facts, therefore, that while the disease is very contagious in childhood, adults are practically immune. No satisfactory explanation has been offered as to the immunity of adults from this disease.

MEANS BY WHICH THE CONTAGION IS TRANSMITTED IN CHILDREN. In children this disease is not in the ordinary sense a venereal disease, that is to say, the manner of its transmission is not by sexual contact. The contagion is carried to the vagina of the child in some way other than that in which gonorrhea is spread among adults.

The grouping of the various causes by which the disease may be spread among children is outlined in the report of the committee above referred to as well as in the voluminous literature of this subject.

The cases due to sexual contact are practically negligible. Here we have another marked difference between gonococcus vaginitis in children and in adults. It is a remarkable fact that a disease which in the adult is rarely transmitted in any other manner than by sexual contact should appear in children as a violent epidemic, spread in an altogether different way. The explanation of the difference in the manner by which this disease is spread in children and in adults has not received a satisfactory explanation. That the adult is very susceptible to the gonococcus contagion is a well-known fact; that children are equally susceptible to this contagion is fully recognized, and yet the manner in which the disease is spread in the child and in the adult could not be more unlike if in each instance it was an entirely different contagion. Is the explanation of these facts to be sought in some unrecognized change in the organism or organisms producing the disease, or in some peculiar change in the susceptibility of the vaginal mucous membrane to this contagion at different ages in the life of the individual?

DURATION AND COURSE OF EPIDEMIC VAGINITIS UNDER TREATMENT. The report of the above committee as to the time required for a cure summarizes as follows: "53 of 71 physicians consider that the time varies from six weeks to six months. One believes that the cure comes only at puberty." That the absolute cure of this disease from a bacteriological stand-point is a matter of great difficulty in a very large percentage of the cases is the opinion of a large number of competent observers. That the disease very commonly, if relapses are taken into consideration, continues for years, even under careful medical supervision, is attested by the literature of this disease.

Every institution which pursues the careful follow-up system of its discharged cases finds that a large percentage of apparently cured cases are subject to relapse. My desire here is simply to call attention to the intractability of these cases under careful methods of treatment, and to the fact that many of them continue for years; yet notwithstanding the prevalence of this disease in childhood the disease practically disappears at puberty. There is no question in my mind but that there is a tendency to a spontaneous cure of this disease at this time of life.

In the report of the above committee only 11 out of 96 physicians were found who "had as adult patients those whom they had treated for vaginitis during childhood." When one considers the prevalence of this disease in young girls and its rarity in older girls, except when produced by sexual contact, one cannot but conclude that this disease in the vast majority of instances is self-limited. As a rule, it disappears as the child approaches puberty, under simple methods of home treatment such as ordinary cleanliness and mild soothing applications applied to the external genitalia. To my mind there is no other explanation for the disappearance of this disease at puberty, for surely the results of our present methods of treatment do not justify us in believing that the sudden disappearance of this disease at this period in the age of the child is due to systematic medical treatment.

COMPLICATIONS AND SEQUELÆ IN EPIDEMIC VAGINITIS IN CHILDREN. My own experience as well as the literature of this disease leads me to believe that complications and sequelæ of epidemic vaginitis in children are much less common than gonococcus complications and sequelæ in the adult. Since 1905, when I encountered and reported an epidemic of this disease in the Cincinnati Hospital, I have had a very large experience with this disease, and during these years I have observed but one possible gonococcus complication (arthritis) in all of the cases that have come under my observation. In the report of the committee above referred to 39 per cent. of the physicians consulted "have seen more or less severe systemic complications," I believe, therefore, that complications and sequelæ in epidemic vaginitis in children

are vastly less common than are gonococcus complications in the gonorrhea of adults.

METHODS OF TREATMENT AND THEIR COMPARATIVE VALUE. In the wide experience which I have had with this disease since 1905 when I reported an epidemic in the Cincinnati Hospital, I have had an opportunity to try many methods of treatment which have been suggested and I have been forced to the conclusion that the simpler methods of treatment such as irrigating the infected parts once a day with two quarts of a normal saline solution followed by the injection of 2 or 3 ounces of a 1 per cent. solution of nitrate of silver are more efficacious than the more severe forms of treatment involving the direct application of strong astringents and antiseptics to the vaginal vault and neck of the uterus. There can be no question as to the advisability of local treatment in these cases; such treatment undoubtedly shortens the course of the disease, and it is not improbable that one observer may get better results by reason of his superior technic with a certain line of treatment than other observers using the same treatment with perhaps less care and skill in the technic.

It is my belief that the intractability of these cases in hospital wards is largely due to reinfection. For this reason we have in the Cincinnati Hospital divided the vaginitis wards into four compartments. New cases are admitted into compartment one and there remain until the Gram-negative diplococcus can no longer be found in the smears taken from just within the vagina. They are then transferred to compartment two and are technically known as first negatives. There they remain under treatment for a week, and if the smear from the vagina at the end of that time is negative they are transferred to compartment three, where the treatment is continued, and are there known as second negatives. If at the end of a week a third negative smear is obtained they are transferred to compartment four and treatment is discontinued. Here they remain for a week or ten days, and if at the end of that time the smears from their vaginas are still negative, they are discharged to the institutions from which they came or into the care of the children's clinic which continues to look after them for a number of weeks to insure their convalescence.

EVILS WHICH MAY RESULT FROM THE TREATMENT OF EPIDEMIC VAGINITIS. I have been much impressed with the idea that physicians have not given sufficient attention to the ill effects which may result from the long-continued local treatment of these cases. In the vaginitis wards of the Cincinnati Hospital my attention was recently called to the fact that a small percentage of the children in this ward were practising masturbation, and an inquiry developed the fact that three older girls of school age who had been in the ward for a long time were teaching the newcomers all kinds of bad habits. They were found to be imitating the physicians in making cul-

tures by introducing instruments into the vaginas of the younger girls. It was therefore felt that it was absolutely necessary to isolate these older children in order to prevent the development of these bad habits in the younger ones.

It is a self-evident fact that more or less harm may result from the frequent handling of the genital organs of these young girls, and this is especially true in cases in which the treatment must be continued over a long period of time. I here call attention to the ill effects which may result, especially from severe and frequent treatment not for the purpose of advocating the discontinuance of local treatment in these cases, but for the purpose of noting the fact that bad as well as good results may follow such treatment.

I have also found that very serious social problems have developed in the treatment of these cases in their homes. At the present time there are 45 of these cases in Cincinnati treated in their homes under the supervision of the Children's Clinic. These cases have been reported to the health authorities, and are therefore not permitted to attend school. They are, I believe, practically the only cases which are reported to the Health Department in Cincinnati. Most of these children are of school age, and many of them, by reason of the fact that they are excluded from the schools, are not only deprived of the educational advantages which the public school offers but they spend a large portion of their time in the streets under unfavorable hygienic and moral conditions. Many of these children go on for months with little or no vaginal discharge, and yet we may be unable for any length of time to obtain from them negative smears indicating that they are from a bacteriological stand-point cured of this disease.

I have been appealed to many times as to the injustice which is being done these children, and yet I have found no way of solving the problem. It is my belief that hundreds of these cases in every large city run a mild course and are unrecognized; these children go to school apparently without spreading the contagion; they have little or no treatment, and yet after a time they spontaneously recover.

It can be seen from the above outline which I have presented that the social and public health problems which this disease presents are very great, and that our knowledge of the disease, from the stand-point of diagnosis, quarantine, and treatment, are not sufficient to enable one to handle this question in a satisfactory manner.

In discussing the question of the handling of these cases by public health authorities, and whether or not epidemic vaginitis should be classed among the reportable diseases, let the physicians of this country ask themselves whether, in the present state of our knowledge of this disease, they would be willing to report to the health authorities a case occurring in their own families

the diagnosis of which rested solely upon the morphological and staining characteristics of the organisms found; that is to say, upon the fact that a Gram-negative, intracellular, biscuit-shaped diplococcus was found. If the term gonorrheal or gonococcus vaginitis were for the present dropped from the literature and the term epidemic vaginitis substituted (this name not suggesting to the lay mind a venereal disease), I think it would be much easier to handle these cases from a public health stand-point.

It appears to me very evident that until we are in a position to make vaginitis a reportable disease and enforce the ordinary health regulations which are used in other reportable diseases we are not justified in excluding these cases from our public schools.

HOW CLOSELY DO THE WASSERMANN REACTION AND THE PLACENTAL HISTOLOGY AGREE IN THE DIAGNOSIS OF SYPHILIS?

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The unimpeachable diagnosis of syphilis is made upon the demonstration of the Spirocheta pallida. After this fact became established the hope was entertained that the organism might be found regularly in syphilitic placentæ, but competent investigators declare that although prolonged search (Trinchesi[1]) is more frequently successful, the spirochetes are readily demonstrable in the placenta approximately in every third case of syphilis (Mohn,[2] Bab,[3] Graefenberg[4]). Generally, therefore, the diagnosis rests upon the less specific evidence of the histological changes in the chorionic villi or the Wassermann reaction in the mother's blood. As neither of these tests affords absolute proof regarding the presence of syphilis, we should know how frequently they point to the same conclusion; and, if not always, is one test more reliable than the other?

Besides variations in the Wassermann reaction due to the technic

[1] Bakteriologische und histologische Untersuchungen bei kongenitaler Lues, München. med. Wchnschr., 1910, lvii, 570.

[2] Die Veranderungen an Placenta, Nabelschnur, und Eihauten bei Syphilis und ihre Bezuhungen zur Spirochete pallida, Ztschr. f. Geburtsh. u. Gynäk., 1907, lix, 263.

[3] Bakteriologie und Biologie der kongenitalen Syphilis, Ztschr. f. Geburtsh. u. Gynäk., 1907, lx, 161.

[4] Der Einfluss der Syphilis auf die Nachkommenschaft, Arch. f. Gynäk., 1909, lxxxvii, 190.

employed[5] and to the interpretation of the degree of fixation, the specificity of the test is impaired, since occasionally a positive reaction is independent of syphilis. Thus, fixation has been observed in cases of malaria, of malignant growth, of hepatic disease, and of some tropical infections, as sleeping sickness. On the other hand, in an appreciable number of syphilitics, the reaction is negative even during the secondary period of the disease. If interpreted in the light of the clinical history the reaction is rarely misleading, but this means, of course, that as yet implicit reliance upon the test is not justified. With newborn infants, Bar and Daunay[6] report notable inconsistency in the Wassermann; frequently they obtained a negative reaction when syphilis was known to exist.

It is also true that, one after another, the placental phenomena regarded as characteristic of syphilis have been questioned. Upon the gross appearance of the organ it is unsafe to base a diagnosis, for macroscopic signs of the disease are not constant; they were absent in 82 of 160 syphilitic placentæ which Mracek[7] examined. And, conversely, when the fetus dies sometime before it is born, whether syphilis is the cause or not, the placenta may be firmer than usual, its color may be a pale gray, and the maternal surface may have a greasy appearance.

Large placentæ do not, as was once supposed, necessarily denote syphilis. Labourdette[8] found that the relationship between the weight of the placenta and the weight of the fetus may not be used to establish a diagnosis. In cases in which syphilis was excluded, not infrequently this ratio was 1 : 5, 1 : 4, and occasionally 1 : 3. When the infant is premature this ratio is more significant, but prior to term we must remember that the placenta normally weighs more than a sixth of the weight of the fetus.

In the umbilical cord, as in the placenta, Emmons[9] had great difficulty in demonstrating spirochetes, and no syphilitic cord lesion is regularly found. An exudative inflammation about the vessels which Bondi[10] declared pathognomonic for syphilis may be caused by bacterial infection.[11] In typical cases when due to syphilis the infiltration appears at the fetal end; when due to placental bacteremia, at the maternal end of the cord. However, exceptions are frequent and greatly impair the diagnostic value of this lesion.

[5] Swift: Serum Diagnosis of Syphilis, Jour. Am. Med. Assn., 1916, lxvi, 599.

[6] Recherches sur le sero-diagnotic de la Syphilis chez la femme enceinte et l'enfant nouveau-ne (Methode de Wassermann), Obstetrique, 1909, n. s., ii, 192.

[7] Die Syphilis der Mutter und der Neugeborenen, Wien. klin. Wchnschr., 1903, xvi, 519.

[8] Gros Placentas et Syphilis, Paris Thesis, 1915.

[9] The Diagnostic Value of the Search for Spirocheta Pallida in the Umbilical Cord of the Newborn, Boston Med. and Surg. Jour., 1910, clxii, 640.

[10] Die Syphilitischen Veranderungen der Nabelschnur, Arch. f. Gynäk, 1903, lxix, 223.

[11] Slemons: Placental Bacteremia, Jour. Am. Med. Assn., 1915, lxv, 1265.

The most trustworthy evidences of placental syphilis to which Fraenkel[12] directed attention in 1873 are the histological changes in the chorionic villi. When freshly teased in dilute hydrochloric acid, originally recommended by Eckhardt,[13] or in water and examined under the microscope, the syphilitic villi appear abnormally large, opaque, and irregular in shape, with swollen ends. Characteristically the branching is limited and the bloodvessels are indistinct. While these findings are suspicious before the diagnosis of syphilis is made, stained sections should be examined. These provide a more satisfactory opportunity for studying the lesion.

The pathological process begins as a proliferative inflammation in the walls of the smallest bloodvessels—those of the terminal villi. Frequently the lumen of the vessel is obliterated. The enlargement of the villi is the result of the proliferation of the stroma. At last the syncytium which covers the villi proliferates and invades the underlying tissue.

While the changes in the villi constitute the most distinctive evidence of placental syphilis they have not been accepted by everyone as pathognomonic. In 1903 Hitschmann and Volk[14] observed a similar microscopic picture in cases in which a history of syphilis was unobtainable. "All the histological evidence thus far counted characteristic of placental syphilis," they dramatically conclude, "may be found in other conditions and even in normal cases. Perhaps these are cases of occult syphilis; who will bring the proof?" Since this question was asked the serological method of establishing the diagnosis has been devised; and we have accepted the opportunity to control the microscopic examination of the placenta with the Wassermann reaction in the mother's blood.

Two series of observations have been made, namely, the first upon 260 consecutive cases,[15] in San Francisco, in which the Wassermann reaction was made by Dr. L. S. Schmitt,[16] and the second upon 100 consecutive cases in New Haven, where Dr. A. L. O'Shansky[17] made the serological tests. These observations may be classified as follows:

Group.	Wassermann.	Placenta.	Number of cases.
I	Negative	Negative	243 (San Francisco) 93 (New Haven)
II	Positive	Positive	7 " " 3 " "
III	Negative	Positive	1 " " 0 " "
IV	Positive	Negative	10 " " 4 " "

[12] Ueber Placentarsyphilis, Arch. f. Gynäk., 1873, v, 1.

[13] Quoted by Rosinski: Die Syphilis in der Schwangerschaft, Stuttgart, 1903.

[14] Zur Frage der Placentarsyphilis, Wien. klin. Wchnschr., 1903, xvi, 822.

[15] Slemons: The Results of Routine Study of the Placenta, Am. Jour. Obst., 1916, lxxiv, 177.

[16] Both Doctor Schmitt and Doctor O'Shansky used two antigens, namely, (1) acetone insoluble alcoholic extract of ox heart, and (2) cholesterinized alcoholic extract of ox heart.

[17] Loc. cit.

In Groups I and II, which include 345 cases (95 per cent.), the Wassermann reaction and the placental histology agree absolutely and indicate the presence of syphilis in 10 cases, its absence in 235 cases.

The single case in Group III, in spite of the negative Wassermann, must be regarded as syphilitic. This woman, aged twenty-seven years, had four consecutive miscarriages. The pregnancy we observed ended spontaneously at the eighth lunar month. The fetus, 40 cm. long, weighed 1960 grams. The placenta weighed 480 grams (one-quarter the weight of the fetus) and the chorionic villi were definitely syphilitic. At autopsy upon the fetus the lesions of congenital syphilis were demonstrable. Therefore the weight of evidence points to the presence of syphilis, and we conclude that occasionally when the Wassermann reaction is negative the placental findings are more reliable.

Other investigators have found a negative Wassermann reaction in cases of syphilis. In the secondary period of the disease the test was positive in 87 per cent. of Bruch's[18] cases, 92 per cent. of Levaditi's, 96 per cent. of Blumenthal's, 98 per cent. of Blaschko's and 100 per cent. of Schmenfeld's. Later in the disease Kirschman[19] obtained a positive reaction in only 68 of 100 syphilitic patients. When the infant was syphilitic, Knopfelmacher and Lehndorff[20] failed to obtain a positive Wassermann in the mother's blood in 9 per cent. of his cases. If experience counts, these observations made several years ago are less accurate than serologists now obtain. At present many authorities hold that active syphilis is always accompanied by a positive Wassermann, though with latent syphilis they concede the frequency of a negative reaction approximates 20 per cent. (Kolmer[21]).

Group IV, comprising 14 cases (10 in San Francisco and 4 in New Haven), is not so discordant as would at first appear, for strong fixation (+ + +) occurred in only two instances. One of these patients was suffering from a streptococcus infection which probably was responsible for the positive reaction; at least the Wassermann test alone raised the question of syphilis. There was no history of a specific infection, and the chorionic villi were normal. On the other hand the fetal surface of the placenta was the seat of an inflammatory infiltration; streptococci were found in the subamniotic connective tissue and also in microscopic sections of the cord. On the third day of the puerperium the organism was isolated from the uterine cavity. The infant died of hemophilia; at autopsy none of the lesions of congenital syphilis were

[18] Bruch, Levaditi, Blumenthal, Blaschko, Schmenfeld, Kirschmann: Quoted by Labourdette (8).

[19] Loc. cit.

[20] Das Collesche Gesetz und die neuen Syphilis-forschungen, Jahrb. f. Kinderh., 1910, lxxi, 156.

[21] Syphilis and Life Insurance, Jour. Am. Med. Assn., 1916, lxvi, 1435.

demonstrable. Therefore the positive Wassermann would not seem attributable to syphilis.

Another case in this group with a strongly positive Wassermann reaction, but negative placental findings was syphilitic. On September 5 and again on the time of delivery, November 18, 1914, the serological test was positive. Furthermore, the mother gave a history of specific infection eight months previously and had not been treated. On account of the maceration of the fetus the autopsy findings were not helpful.

The teased chorionic villi were suspicious of syphilis, though the stained sections were negative. However, other areas of the placenta might have presented the characteristic evidence of syphilis, for normal areas may occur in syphilitic placentæ. Clearly in this case the weight of evidence favors the diagnosis of syphilis and indicates that occasionally the Wassermann reaction is more trustworthy than the placental histology—a situation which will exist most frequently in cases of postconceptional syphilis.

The remaining 12 cases of Group IV presented faintly a positive Wassermann reaction. The serologist reported 8 results as a single + (25 per cent. fixation) and 4 results as a double ++ (50 per cent. fixation). It is significant that 10 of these patients were suffering from eclampsia or a toxemia of pregnancy with albuminuria.

In the early history of the Wassermann test the occurrence of a suggestive or a positive reaction in cases of eclampsia was noted by Bunzel,[22] Daunay,[23] and others. Semon[24] obtained 3 positive, 9 negative, and 1 doubtful reaction in eclamptics without syphilis. We are unable to substantiate Semon's statement that the reaction is negative when the auto-intoxication is mild. On the contrary the severity of the intoxication bears no relation to the degree of fixation. A double + was twice reported when the albuminuria was of a mild type, while in several eclamptics with severe albuminuria we obtained a single +.

It is almost certain in these cases that the fixation was due to the metabolic disturbance. In similar circumstances Bunzel observed that the Wassermann became negative as the toxemic symptoms disappeared. We have not been able to make repeated observations upon our patients, but their histories excluded syphilis and the placentæ were normal. The infants were healthy at birth, in excellent condition when they left the hospital, and when visited four weeks later none of them had developed stigmata of congenital syphilis.

The frequency with which a positive Wassermann reaction

[22] Untersuchungen auf Komplementinde Substanzen im Blute von Schwangeren und Wochnerinnen, Zentralbl. f. Gynäk., 1909, xxx, 975.

[23] Quoted by Davis: Syphilis in its Relation to Obstetrics, Tr. Am. Gynec. Soc., 1916.

[24] Eklampsie und Wassermann Reaktion, Zentralbl. f. Gynäk., 1911, xxxv, 556.

occurs during toxemia of pregnancy and the question of its association with a definite form of auto-intoxication are pertinent problems. The limited data at hand will not permit an uncompromising view, but in our experience every third or fourth case of threatened and active eclampsia presents some degree of fixation, generally between 25 and 50 per cent. Whether syphilis underlies the toxemia is a question which can scarcely be raised, since Bunzel demonstrated that the serological reaction becomes negative as the auto-intoxication of pregnancy disappears.

In the course of chemical analysis of the blood having found that the cholesterol varies during pregnancy, and that the amount of this substance, while normal in some cases of toxemia, is greatly increased in others, we suspected that the latter group might be the one in which the faintly positive Wassermann reaction occurred. But this is not true. A negative Wassermann was reported for patients when the cholesterol amounted to 245, 180, and 125 mg. per 100 c.c., whereas 25 per cent. fixation was noted when the cholesterol was 144 mg.

In cases in which none of the classical symptoms of toxemia are present and the pregnancy apparently is normal, occasionally the Wassermann in the mother's blood is faintly positive. We encountered only two such cases, but Pedrini[25] observed the phenomenon more frequently, and in consequence records a positive Wassermann in 10.7 per cent. of the pregnant women he examined. Generally the reaction is faint, and without clinical evidence of syphilis it would be interpreted as negative. For the present the meaning of fixation in these circumstances is unknown, but probably it is explained by the presence of some substance in the blood referable to the metabolism of pregnancy. At all events the occurrence of the phenomenon in normal cases as well as toxemias emphasizes the value of controlling the diagnosis of syphilis with the microscopic study of the chorionic villi.

To recapitulate, the comparative study of the Wassermann reaction and the placental findings in 360 consecutive confinements indicates that the tests agree absolutely in 95 per cent. of obstetrical patients.

The chief source of confusion lies in the presence of a toxemia of pregnancy, which may be responsible for a faintly positive reaction. In these circumstances the fixation should not be taken to indicate syphilis, and accepting that interpretation, the serological test and the placentæ agree 99 times out of a 100.

Frankly contradictory results were encountered in three instances. One patient who gave a positive Wassermann was not syphilitic. The other two patients were syphilitic; the first presented a negative

[25] Una casistica di sieroreazioni di Wassermann nel campo ostetrico, Ann. di Ostet., 1910, ii, 365.

Wassermann but positive placenta, the second a positive Wassermann but negative placenta. Therefore it is impossible to say that one test is more reliable than the other, except in cases of postconceptional syphilis, and then the Wassermann reaction is more trustworthy. On the other hand, in latent syphilis the placental histology alone may confirm what is learned from the maternal history or the examination of the fetus.

At present the advisable procedure for the recognition of syphilis in parturient women begins with the study of the freshly teased chorionic villi—an examination which should be made routinely in obstetrical practice. If their appearance points toward the presence of syphilis, hardened and stained sections of the placenta must be studied and the Wassermann reaction in the mother's blood must be determined. Furthermore, all these observations should be made whenever the fetus is premature, macerated, or stillborn.

Instances in which the Wassermann reaction and the placental histology yield contradictory results are rare: If these cases are judged in the light of subsequent serological tests upon the mother, of facts in her history, and of the results of clinical or pathological examination of the fetus, they may be properly classified.

A STUDY OF VON JAKSCH'S ANEMIA.*

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Although cases of anemia accompanied by enlargement of the spleen and occurring in children were described clinically by Gretsel[1] as long ago as 1866, and pathologically by Cohnheim[2] in the preceding year, it was not until more than twenty years later, when the examination of the blood began to play a prominent part in clinical investigations, that the various conditions included under this head began to be separated one from the other. In 1889 von Jaksch[3] described a case of leukemia in a child, aged fourteen months, and in the following year[4] he reported 3 cases of enlarged spleen in children, a condition which he called anemia pseudoleukemica infantum. This was characterized by a diminution in the hemoglobin and in the number of red cells, marked persistent leukocytosis, sometimes glandular enlargement, slight enlargement of

* Read at a meeting of the Section on Medicine of the Academy of Medicine, January 18, 1916.

the liver, a marked enlargement of the spleen which was out of all proportion to the size of the liver, and a tendency to recovery. One patient died and the autopsy revealed no evidence of syphilis or leukemia. After this publication cases were recognized with comparative frequency, and there are numerous reports in the literature which deal with the subject. However, in spite of the comparatively abundant material and the obviously large amount of time which has been devoted to it, we have advanced but a very little way toward a clear understanding of the condition. Part of this is due, no doubt, to the lack of autopsy material, but the greater part is due to the fact that our investigations lead us to a blank wall, beyond which our present knowledge and methods do not permit us to penetrate. In this study of the condition, therefore, I shall have nothing very new or startling to present, but shall endeavor to clarify one or two points which have been the source of much discussion, and shall record the results of a method of treatment which, though not new, has not as yet been very extensively followed. Three cases of von Jaksch's anemia have rather recently been under observation in the New York Hospital, and form the basis for the present discussion.

CASE I.—M. M., a girl, aged nine years, Italian, was admitted to the service of Dr. Conner on April 19, 1913. Her family history was negative. She had had measles in infancy, but gave no history that would permit one to suspect that she had suffered from rickets at any time. At the age of two years she is said to have had an attack of malaria, and since that time her spleen has been persistently large. Malarial organisms had never been demonstrated in her blood, but at the time of her first attack she was living in a district in which malaria was very prevalent, and for the next six years she is said to have suffered yearly with attacks of intermittent chills and fever.

The patient was well nourished and developed. Heart enlarged, apical impulse tapping, and a blowing systolic murmur was heard at the apex and transmitted but a short distance into the axilla. Over the aortic area this murmur was much rougher in quality. The liver dulness extended from the fourth rib to 8 cm. below the costal margin. The splenic dulness began in the axilla at the eighth rib, and the organ almost filled the left flank, extending to 14 cm. below the costal margin and almost to the median line at the level of the umbilicus. The spleen was hard and smooth and not tender. There were large, slightly tender glands under the angle of the jaw. Weight, 47 pounds. Eye-grounds and ears negative. Blood cultures and Wassermann negative. Von Pirquet test faintly positive. The stools were constantly positive for stercobilin and negative for bilirubin and blood. The urine showed a varying output of albumin, from none up to a heavy precipitate, with occasionally a few casts. Urobilin was constantly present. The

phenolsulphonephthalein output was 80 per cent. in two hours. The red cells numbered 2,300,000, hemoglobin 25 per cent., color index 0.5. White cells 8100,[5] polynuclears 58 per cent., lymphocytes 36 per cent., eosinophiles 1 per cent. The red cells exhibited marked poikilocytosis, anisocytosis, polychromatophilia, and basophilic granulation. There were 53 nucleated red cells for every 100 whites, 4300 per c.mm. A test of the resistance of the red cells showed that hemolysis began at 0.62 per cent. NaCl, and was complete at 0.44 per cent. "Vital staining cells" made up about 35 per cent. of the total number of red cells. Repeated attempts to find malarial parasites were unsuccessful. One examination of her blood serum showed no urobilin but a faint trace of bilirubin.

Her temperature varied between 100° and 102.° She was given arsenic until her tolerance limit was reached, and then was put upon quinin, a few doses intravenously, but most of it by mouth. Following the administration of the quinin her temperature fell during two days from 101° to 98°, but later rose again. During her second week in the hospital she developed a dry pleurisy which was relieved by strapping. Her red cells rose gradually to 3,900,000 and hemoglobin to 43 per cent., the index remaining at about 0.5. The nucleated red cells rose to 121 for every 100 white cells, fell to 3 and later rose again to 27, but were constantly present. Megaloblasts also were constantly found. The white cells varied somewhat, but rose to 13,500 before her discharge, which took place on June 16, 1913.

She spent the summer in the country and began at school in the fall. She then began to lose ground and to complain of pains in her legs and weakness. She was taken out of school, but gradually became worse, and for the two weeks before her second admission was unable to get about. She was readmitted to the hospital on January 12, 1914. At that time she showed marked pallor of the skin and mucous membranes. The heart signs were essentially the same as on the former admission. The liver dulness extended from the fifth rib to 10 cm. below the costal margin. The spleen had increased in size and now extended to within two fingers breadths of the symphysis and 2 cm. across the median line. The lymph nodes were not generally enlarged. Her red cells numbered 2,400,000, hemoglobin 25 per cent., color index 0.5. White cells were 15,000, polynuclears 40 per cent. The nucleated red cells were present constantly in small numbers. Her weight was 47 pounds. The urine showed only a faint trace of albumin and no casts. Her temperature varied between 100° and 103°. During the next two months she received arsenic most of the time. She showed no tendency toward improvement, and it was decided that the removal of the spleen might exert a favorable influence upon the course of the disease. She was, therefore, transferred to the first surgical division, and on March 21, 1914, Dr. Hitzrot removed a

spleen weighing 1420 grams and measuring, after fixation in formalin, 20 x 13 x 8 cm. It was surrounded by a number of adhesions, which made its removal rather difficult, and a hypodermoclysis was given during the operation. There were several small accessory spleens which were left in the abdomen.

Following the operation she had a rather stormy convalescence, with a sharp temperature reaction, though the wound healed promptly. On the day after the operation she had a marked normoblastic crisis, the nucleated red cells numbering more than 25 for each white cell. During the next six weeks she improved noticeably, the red cells rising to 4,100,000 and hemoglobin to 49 per cent., the index remaining at about 0.5. Her weight increased from 37 pounds immediately after the operation to 48 pounds on discharge. The white cells varied between 13,000 and 16,000. The nucleated red cells dropped in number rather rapidly, but rose again until, upon her discharge on May 5, 1914, they numbered five times as many as the white cells.

After leaving the hospital she continued to improve, and the following winter went to school and progressed satisfactorily in her work. When last seen on February 6, 1916, twenty-three months after the splenectomy, she seemed well in every way, and weighed 80 pounds. At that time the examination of her blood gave the following result: red cells 4,600,000, hemoglobin 65 per cent, color index 0.7. White cells 19,200, polynuclears 31 per cent. Nucleated red cells 138 for each 100 white cells, 2 of these being megaloblasts. The blood picture, as a whole, was essentially the same as upon her first admission to the hospital, except for the fact that the number of red cells and the hemoglobin percentage were both increased.

CASE II.—S. K., a male child, aged eight months, was admitted to the service of Dr. William R. Williams on July 22, 1914. His family history was negative. He was a premature child, having been born at the seventh month of pregnancy. He was breast-fed for four months and then put upon a formula of modified milk. At the age of two months he had an attack of bronchopneumonia and two months later a second attack. At five months he suffered from gastro-enteritis. Since being put upon the milk formula, about four months before admission, he had failed to gain in weight, and in addition had suffered from restlessness, fretfulness at night, more or less sweating of the head, and constipation.

He was a poorly nourished, pale child, with no teeth, a square cranium, moderate rachitic rosary, and enlargement of the epiphyses at the wrists and ankles. The abdomen was prominent and the spleen enlarged, the edge being felt 6.5 cm. below the costal margin in the left nipple line. Weight 10 pounds 11 ounces. The Wassermann reaction was negative. The red cells numbered 1,400,000, hemoglobin 30 per cent., color index 1.0. The white cells were 37,000, polynuclears 33 per cent. There were 27 nucleated red

cells for each 100 white cells. During the next three weeks the condition of the patient remained the same, though the red cells rose to 2,300,000 and the hemoglobin to 45 per cent. The white cells varied from 17,000 to 54,000. Nucleated red cells were constantly present, at times rising to 61 per 100 whites. Megaloblasts were seen from time to time. On August 17, 1914, the patient was transferred to the second surgical division, where he was operated upon by Dr. Pool, who has reported the case.[6] After a transfusion, by which he received 150 c.c. of blood from his father, a splenectomy was performed, the organ weighing 105 grams and measuring 10 x 7 x 4 cm. Following the operation the child showed a definite clinical improvement, though his convalescence was impeded by the occurrence of rather frequent attacks of bronchitis. The red cells rose to 4,000,000 and hemoglobin to 85 per cent., the index remaining high. The nucleated red cells rose to 131 for every 100 white cells and the later fell. They were constantly present, though they fluctuated markedly in number. He was discharged on November 5, 1914, weighing only 12 pounds, but looking much better than he did on admission, and apparently improved. He continued his improvement for some little time until he developed another attack of bronchopneumonia, and died at home about two months after his discharge. No autopsy was obtained.

Case III.—A. A., a female child, aged eighteen months, was admitted to the service of Dr. William R. Williams on April 14, 1915. Her family history was negative. The patient was a full-term normal baby, was breast-fed for one year, and after that was fed both breast and bottle. She cut her first teeth at the age of twelve months. She had not talked or walked up to the time of admission. Her abdomen had been larger than normal since she was ten months old. Two months before admission she was sick for three weeks with an attack of pneumonia, since which time her abdomen has been more markedly distended. Appetite good. She had a slight cough for two weeks before admission.

The patient was a well-developed, fairly well-nourished child, weight 15 pounds 5 ounces. The central incisors only were present. The anterior fontanelle measured 3.5 cm. in diameter, the posterior fontanelle was closed. There was no craniotabes, but a rachitic rosary was present. The heart and lungs were negative. The abdomen was large and distended, the swelling being due in large part to the presence of an enlarged spleen, which extended to 15 cm. below the costal margin in the left nipple line. The edge was hard, firm, smooth, but not tender. The liver was felt 4 cm. below the costal margin. There were dilated venules over the surface of the abdomen. There were a few discrete enlarged nodes in the submaxillary, anterior and posterior cervical chains, and in the axillary and inguinal regions. The Wassermann reaction was

negative. The red cells numbered 2,700,000, hemoglobin 45 per cent., color index 0.8. White cells 12,000, polynuclears 47 per cent. There were 12 nucleated red cells for each 100 white cells. Myelocytes were rarely seen. There was marked poikilocytosis, anisocytosis, and polychromasia, and many of the red cells showed basophilic granulation. The urine was negative. The temperature ranged between 98° and 100°. Her condition remained unchanged for two weeks, when she was transferred to the second surgical division. On May 1, 1915, she was operated upon by Dr. Pool, who removed a spleen weighing 227 grams and measuring $14\frac{1}{2} \times 9\frac{1}{2} \times 3\frac{1}{2}$ cm. Following the operation there was acetone and diacetic acid in her urine for several days. She made a rather rapid convalescence, showing signs of improvement within a few days after the splenectomy. She then contracted measles, which was accompanied by a severe bronchitis, but which interrupted her convalescence only temporarily. Her red cells rose to 4,500,000 and hemoglobin to 60 per cent., and she was discharged on June 11, 1915, weighing 15 pounds 13 ounces, and very much improved. She continued her improvement, and was seen last on January 12, 1916, eight months after her operation, and twenty-six months old. At that time she looked very well. Her weight was 22 pounds; she had 12 teeth, and was able to stand, but did not talk or walk. Her red cells were 5,700,000, hemoglobin 67 per cent., and color index 0.6. Her white cells were 21,900, polynuclears 36 per cent., eosinophiles 6 per cent. She was said to have a good appetite and to eat everything, but it is probable that her diet is not nicely suited to her requirements. It has been very difficult to make the parents understand the necessity of feeding the child properly.

Von Jaksch's anemia may be defined as a condition occurring in children and marked by anemia, slight enlargement of the liver and marked enlargement of the spleen, and sometimes an enlargement of the superficial lymph nodes. The blood picture is characterized by a great diminution in the red cells and the hemoglobin and a persistent leukocytosis of varying degree. Nucleated red cells are nearly always present, sometimes in large numbers, and occasionally myelocytes are seen. Most of the patients show a definite tendency to recovery, though a few die. In those who live the abnormal blood picture may persist for a very long period of time even though the patient is clinically well. Anemia pseudoleukemica infantum, the name originally given to the condition, is not a very appropriate one, for the term pseudoleukemia has since acquired rather a special meaning, and the condition to which it is applied has no relation to the one under discussion. Of late years there has been a tendency to call it anemia splenica infantum, which is even less desirable, for splenic anemia is a descriptive term which is applied to a large number of unrelated conditions. Wentworth[7] and Sutherland and Burghard[8] have called attention to the necessity

of distinguishing von Jaksch's anemia from that form of splenic anemia without leukocytosis in children, a condition which seems to be entirely distinct from the one under discussion. Splenic anemia with leukocytosis occurring in children is a cumbersome phrase and it therefore seems preferable to retain the eponymic term and call it von Jaksch's anemia which has at least the merit of general usage.

ETIOLOGY. From the first it was noted that von Jaksch's anemia was frequently associated with rickets, and von Jaksch[4] was of the opinion that rickets played a certain part in its etiology. Nevertheless, he said it could occur in non-rachitic children, and several cases are reported in which no evidences of rickets could be found. In one of the cases here presented (Case I) there was no history or evidence of rickets, but there was a good history of repeated attacks of malaria, though the plasmodia were never demonstrated. Jungman[9] has reported a case in which a pregnant woman had a similar blood picture and recovered in two months after delivery. The baby also had the same condition, but became entirely normal in about three weeks. In some instances syphilis has been accepted as the causative factor,[10 11] while tuberculosis, gastro-intestinal upsets and infections, such as bronchopneumonia,[12] and malaria,[13] may all at times play a part. The view held by Grätz[14] that von Jaksch's anemia is merely an early stage of Banti's disease is apparently an unsupported belief. Although it cannot be said that rickets is the cause of von Jaksch's anemia, nevertheless there is apparently a certain relationship between the two.[15] They both occur at about the same time of life. The factors of importance in the etiology of the one appear also in the etiology of the other. Moreover, rickets is a disease in which the bone marrow is seriously affected and which is generally accompanied by more or less anemia, though the anemia and the obvious bone changes do not often parallel each other in severity. In addition, rickets is often accompanied by a leukocytosis, and in at least 20 per cent. of the cases there is more or less enlargement of the spleen. Marfan[16 17] even goes so far as to say that von Jaksch's anemia is rickets. His idea is that, in rickets, the primary lesion is a change in the bone marrow and a consequent compression of the osteogenetic portion of the bone, and that in those cases of von Jaksch's anemia in which there are no evident signs of rickets this disturbance of bone formation has not occurred. There is not sufficient evidence to support this belief. In early childhood the blood-forming centres are more or less unstable, so that they are apt to react intensely to a moderate stimulus,[18] and those factors which have been included as influencing the development of rickets and von Jaksch's anemia are the ones which are most apt to affect the hematopoietic organs. It is logical to conclude, therefore, from the available evidence, that von Jaksch's anemia is due to the action of toxic or infectious agents

which may or may not at the same time produce rickets. The source of these toxins is not necessarily in the gastro-intestinal tract.[19] The experiments of Courcoux and Ribadeau-Dumas showed that a guinea-pig injected with an alcoholic extract of fecal material from a patient suffering from von Jaksch's anemia might develop a similar blood picture,[20] but they were not sufficiently controlled, and the authors' deductions cannot be accepted. The relation between rickets and von Jaksch's anemia may be analogous to that existing between bothriocephalus infection and pernicious anemia. Either may exist alone, but the two do exist together in a notable percentage of cases, and it is impossible to escape the conclusion that they are in some way related.

Pathology. There is anemia of the organs generally, often associated with more or less fatty degeneration. There may be petechiæ, and in some instances there have been described hydropic collections in the body cavities. The chief interest, of course, centres in the hematopoietic organs, the liver, spleen, bone marrow, and lymph nodes. The lymph nodes are apt to be cherry red and enlarged, the so-called hemolymph nodes. The liver shows a reversion to the embryonal type of blood formation, and exhibits areas of hemopoiesis. The bone marrow is hyperplastic, of the myeloblastic type, and dark bluish red. Smears made from these organs reveal the presence of nucleated red cells.[18] The organ which has excited the greatest attention is the spleen. In this series of cases the spleens are of the greatest interest, since they show in a beautifully clear manner, three stages in the development of the pathological process. The earliest stage is seen in the spleen removed in Case III. The organ was bright red, the surface smooth and glistening, and the capsule thin. The consistence was rather tough and leathery. On section the cut surface was grayish red, with a sort of a brownish tinge, and very finely granular. The Malpighian bodies were numerous, about normal in size, and fairly well circumscribed. The trabeculæ were indistinct. On microscopic examination it is at once seen that the pulp is more cellular than normal, and that there are many minute hemorrhages in the splenic tissue, which is, however, not congested. The follicles present the appearance of having been compressed, being somewhat smaller than normal, with pale centre and dense periphery. There is a marked increase in the pulp cells, which are arranged in cords and strands. Scattered through the pulp are found small collections of large, rather pale-staining cells with basophilic cytoplasm. The nuclei contain definite nucleoli. They may be considered as undifferentiated mononuclear cells. Sections stained with the Jenner stain show many nucleated red cells and neutrophile and eosinophile myelocytes in the pulp. The mononuclear eosinophiles are strikingly numerous. Actively proliferating cells are seen in the sinuses.

The spleen from Case I presents an intermediate picture. The organ was of approximately normal shape, the capsule being everywhere smooth and transparent. On section the cut surface bulges considerably, is of a uniform dark brown color, smooth and shining, and rather firm and leathery to the touch. No trabeculæ or lymph follicles can be distinguished, the color being quite uniform throughout. Microscopic sections show the organ to be very vascular and considerably congested. There is also considerable diffuse connective-tissue increase which is most extensive along the trabeculæ. The follicles are small and rather poorly differentiated, the lymphatic tissue being greatly encroached upon by the spleen pulp. The sinuses still persist and are filled with the large undifferentiated mononuclear cells. These cells are distinctly more numerous than they are in the preceding section. The pulp is arranged in larger cords and strands than in the previous section, and when stained with the Jenner stain is seen to contain enormous numbers of neutrophile myelocytes and nucleated red cells. The same types of cells can be recognized as are described in the previous section.

In Case II the process has progressed still further. The spleen is normal in shape, fairly firm in consistence. The surface is smooth and bluish gray in color. The capsule is normal in thickness. The cut section is smooth, pale, and grayish red in color. The Malpighian bodies are few in number, extremely small, and indistinct. The trabeculæ are not prominent. The microscopic section shows at once a more extreme picture than is seen in either of the other two sections. The follicles are very small, the lymphatic elements evidently regressing. The pulp is more cellular, and is quite remarkably homogeneous in appearance, the undifferentiated mononuclear cells predominating and arranged in cords and strands so that they form a network through the whole pulp. There are also a number of so-called plasma cells which are still more basophilic in appearance. The sinuses are practically absent. The myeloidization of the spleen pulp is also evident in this section, there being many neutrophile and eosinophile myelocytes and nucleated red cells to be seen.

The picture then in the spleen is connective-tissue increase, atrophy of the Malpighian bodies and myeloid metaplasia. Ostrowsky's statement[13] that the atrophy of the follicles is due to connective-tissue increase was not borne out by the sections in our cases, it being apparently due rather to increase in the pulp element. The agreement between the histological pictures in the spleens from these three cases suggests that in spite of the differences in the clinical conditions presented, we are nevertheless dealing with a single pathological process. It is noteworthy that the most advanced stage was seen in the spleen removed from the youngest patient, the one who afterward died.

The symptoms of von Jaksch's anemia consist chiefly of the

symptoms of anemia in general, pallor, edema, weakness, dyspnea, etc., a large liver and very large spleen and a characteristic blood picture. Occasionally there is enlargement of the superficial lymph nodes, and there may be fever. The onset is gradual and the patient usually comes under observation with a well-marked enlargement of the spleen.[21] The symptoms which are due to the anemia itself may be masked by the presence of symptoms due to the accompanying conditions such as syphilis, tuberculosis, or rickets. The blood picture must be depended upon for a diagnosis. There is marked diminution in the hemoglobin and in the number of red cells. The color index is low in the majority of cases. Naegeli[18] says that the higher the index the worse the prognosis, and this is borne out by Case II of our series. Giffin's statement[22] that a high color index is characteristic of the condition is not borne out by the cases reported either here or in the literature. Nucleated red cells are generally present, often in overwhelming numbers, though some authors insist that their presence is not essential for a diagnosis. Megaloblasts are seen whenever the red cells are present in all marked numbers. One type of cell deserves special mention, since we believe it to be the parent cell of the megaloblast. The nucleus shows the radial structure, which is considered typical of the megaloblastic nucleus, while the cytoplasm is intensely polychromatophilic, having a peculiar slaty blue color. In many of these cells it is impossible to make out the presence of any hemoglobin, and they are probably often mistaken for lymphocytes. The nuclear structure is characteristic, however, and the existence of many intermediate forms renders it extremely probable that they are in fact the parent red cell. Certain it is that once recognized it is easy to pick them out in blood smears. In tissue sections it is more difficult, for the cytoplasm is not so clearly recognizable, and the nuclear structure is apt to be poorly defined. Such cells were found in the blood in all three of our cases. Their significance is quite the same as that of the megaloblast. There is apt to be poikilocytosis, anisocytosis and polychromasia, and a certain percentage of the cells show basophilic granules in their cytoplasm. These are all evidences of rapid blood regeneration. One of the most important criteria, as insisted upon by von Jaksch and supported by the later authors, is the leukocytosis. This varies greatly in degree even in the same case, and may be anything up to 50,000. The number of leukocytes may at times reach a comparatively low figure, as in our Case I, in which they were once as low as 8000. But a leukocytosis is not as significant in children as in adults.[23] The differential count shows for the most part a mononucleosis. The eosinophiles are about normal. This also is subject to great variations, and sometimes the polynuclears predominate. Myelocytes are not constantly present, but may generally be found. Myeloblasts,

plasma cells, and other abnormal white cells are occasional findings. It will be noted that this blood picture shows a great similarity to the one seen in pernicious anemia during a crisis, except for the color index, which is generally low in von Jaksch's. This has led Naegeli to conclude that the condition is most closely related pathologically to pernicious anemia.

COURSE AND PROGNOSIS. Von Jaksch described this condition as showing a tendency to recovery, and it is no doubt true that many of these cases do eventually recover. It must be admitted, however, that in some instances the condition has a fatal termination. One of von Jaksch's 3 cases died, as did 1 of ours, while Aschenheim and Benjamin[24 25] report 4 deaths out of 5 cases. Many of those who die do so from intercurrent infections, of which bronchopneumonia is the most prominent. The prognosis is, therefore, sufficiently serious. In those cases which do recover the return to normal is apt to be greatly delayed. The blood picture remains more or less abnormal long after the patient is clinically well. In those cases in which definite etiological factor, such as syphilis, can be shown, the prognosis is much better.

TREATMENT. The treatment has been unsatisfactory in the majority of cases. Since they frequently show a tendency to recover, almost any treatment may be followed by improvement. On the other hand, those cases which have progressed to a fatal issue have done so in spite of any treatment which has been given. In a few cases in which an etiological factor has been demonstrated, treatment directed toward that factor has resulted in cure. Labbe and Delille[11] report a rapid cure in an infant with cutaneous syphilides and a von Jaksch's anemia when treated with mercury. Iron, quinin, sunshine, fresh air, and change of climate have all been recommended. Stoos' cases[26] seemed to recover when given arsenic, while Stettner[27] had better results with thorium X. The most prominent feature of this symptom-complex is the enlarged spleen, and since to this organ has been credited the function of the destruction of the red cells, it was inevitable that, sooner or later, splenectomy would be resorted to as a therapeutic measure. Recently Giffin[22] was able to collect 4 cases of von Jaksch's anemia which had been treated by splenectomy. His report includes one of our cases previously recorded by Dr. Pool.[6] There is a possibility that McKendrick's case[28] was one of von Jaksch's though it is not very clear. The two additional cases mentioned here, therefore, make 6 in all which have been treated with splenectomy. The results are interesting, for in all of them the operation was followed by immediate clinical improvement. Wolff's case[29] was followed for three years, and though apparently well, still had a leukocyte count of 20,000. In Graff's case[30] the blood is reported as being "almost normal" nine months after the operation. Fowler's case[31] had been followed but five weeks, and in that time there was but little change

in the blood picture beyond an increase in the hemoglobin. In our Case I, although the child was apparently well eighteen months after her operation, the blood picture was essentially the same as upon her first admission to the hospital, some two and one-half years before. Case II died from bronchopneumonia before any lasting results could be seen. Case III eight months after operation still had a leukocytosis of over 20,000. It is evident then that the condition is not localized in the spleen, and that the other hematopoietic organs must be more or less extensively involved, in spite of Zamboni's statement[32] that the bone marrow rarely shows any changes. In all 3 of our cases the spleen was the site of active blood regeneration, and it is difficult to see how the patients could derive advantage from the removal of such an important centre for the formation of new blood cells. It may be said that the predominant activity of the spleen in these cases is a destructive one, and that the regenerative function is merely secondary, but we are without facts to support this hypothesis. Efforts to obtain hemolytic substances from the spleen in other forms of anemia have been unsuccessful.[33] Nevertheless we have the facts that the operation has been performed in six instances, and that in five of them it was followed by apparently lasting improvement. In this connection it may be interesting to refer to a case reported by Coupland[34] in 1896. He removed the spleen from a woman suffering from what was diagnosed as splenic anemia. Following the operation she showed a marked improvement. Two years later she died with symptoms of portal obstruction and an autopsy revealed extensive syphilitic involvement of the liver. It must be admitted that these cases would perhaps have recovered if left alone. But while under observation they showed no tendency in that direction, and there is no doubt that the splenectomy hastened their recovery. This form of treatment, therefore, has a large place in the therapeutics of von Jaksch's anemia, though it should not be adopted too hastily.

I wish to express my thanks to Drs. Conner, Williams, Pool, and Hitzrot for permission to report these cases and to Drs. Elser, Butterfield, and Tytler for material help in the preparation of this report.

NOTE.—Case I thirty-four months after the removal of the spleen is reported well. She was unable to come to the city for an examination of the blood at that time. Case III was seen on October 21, 1916, three years old and about eighteen months after her operation. She looked perfectly well, weighed 25½ pounds, and had all of her first teeth. An examination of her blood showed 5,700,000 red cells, hemoglobin 89 per cent., index 0.78. The white cells numbered 15,700, polynuclears 24 per cent. No abnormal cells were seen. Since this paper was written we have had the opportunity, through the courtesy of Dr. Frederic H. Bartlett, of seeing sections of a spleen removed at the Babies' Hospital in the course of von Jaksch's anemia. The histological picture corresponded with that described in the cases reported in this paper.

REFERENCES.

1. Gretsel. Ein Fall von Anaemia Splenica bei einem Kind. Berl. klin. Wchnschr., 1866, iii, 212.

2. Cohnheim. Ein Fall von Pseudoleukämie. Virchows Archiv. 1865, xxxiii, 451.

3. v. Jaksch. Ueber Leukemia und Leukocytose im Kindesalter. Wien. klin. Wchnschr., 1889, ii, 435, 456.

4. v. Jaksch. Ueber Diagnose und Therapie der Erkrankungen des Blutes. Med. Wandervorträge, 1890, H. 21. Also Prag. med. Wchnschr., 1890, xv, 403, 414.

5. All of the leukocyte counts reported in this paper have been corrected for the presence of nucleated red cells. The hemoglobin estimations have been corrected by standardization of the Sahli apparatus used.

6. Pool, E. H. Transfusion and Splenectomy for von Jaksch's Anemia. Ann. Surg., 1915, lxi, 349.

7. Wentworth, A. H. Association of Anemia, with chronic Enlargement of the Spleen. Boston Med. and Surg. Jour., 1901, cxlv, 374, 402, 435, 461, 488.

8. Sutherland and Burghard. Treatment of Splenic Anemia by Splenectomy. Lancet, 1910, ii, 1819.

9. Jungmann. Beiträge zur Kenntnis der Schwangerschaftsanämie. Münch. med. Wchnschr., 1914, lxi, 414.

10. Di Cristini. Contributo clinico allo della patogenesi ea eziologia dell' anemia splenica dei bambini. Pediatria, 1911, xix, 801. Ref. Archiv f. Kinderheilk., lviii, 438.

11. Labbe et Delille. Syphilis hereditaire precoce avec splenomegalie, anemie et reaction myeloide du sang, guerie par le traitment. Soc. méd. des hôp., February 6, 1903. Cit. by Le Scornet.

12. Guinon et Simon. Fall von Anaemia pseudoleucaemica infantum. Ann. de méd. et chir. inf., 15, iv, 1909. Cit. by Stettner.

13. Ostrowsky. S. Ueber Anemia splenica infantum. Jahrb. f. kinderh., 1911, lxxiii, 690.

14. Grätz. Unter dem Bilde der Anemia splenica verlaufende extramedulläre Bildung von Blutzellen bei einem 3 jahrige Kind. Zentralbl. f. allg. Pathol. u. pathol. Anat., 1909, xx. Cit. by Stettner.

15. Deléarde et Pellissier. Un cas d'anemia infantile pseudoleucemique. Echo méd. du Nord, 1913, xvii, 125. Cit. by Stettner.

16. Marfan. Le rachitisme et sa pathogenie. Paris, 1911.

17. Marfan. Rachitisme, Osteo-lymphatisme de l'enfance. Traité de méd. et de therap. Gilbert and Thoinot, 1912, xxxix, 235.

18. Naegeli, O. Blutkrankheiten und Blutdiagnostik. Leipzig, 1912.

19. Ashby, H. T. Anemia Associated with Rickets and Gastro-intestinal Disturbances, including Splenic Anemia in Children. Practitioner, 1912, lxxxviii, 675.

20. Courcoux et Ribadeau-Dumas. L'anemie infantile pseudoleucemique. Comp. rend. de le Soc. biol., 1904, lvii, 277.

21. Le Scornet. Étude clinique de la megalosplénie dans la première enfance. Paris Thesis, 1912, No. 437.

22. Giffin, H. Z. Splenectomy for Splenic Anemia in Childhood and for the Splenic Anemia of Infancy. Ann. Surg., 1915, lxii, 679.

23. Hayem. L'anemie des nourissons. Gaz. des hôp., 1889, lxii, 1183.

24. Aschenheim, E. Ueber Beziehungen der Rachitis zu den hämatopoetischen Organen. Deutsch. Archiv f. klin. Med., 1912, cv, 470.

25. Aschenheim u. Benjamin. Ueber Beziehungen der Rachitis zu den hämatopoetischen Organen. Deutsch. Archiv f. klin. Med., 1909, xcvii, 529.

26. Stoos. Anemia pseudoleucemia Jaksch-Hayem mit Rachitis. Corr. Bl. f. Schweiz. Aerzte, 1914, xliv, 823.

27. Stettner, E. Ueber schwere Anämie im Kindesalter. Jahrb. f. Kinderh., 1914, lxxx, 467.

28. McKendrick. Anemia with Enlargement of the Spleen, Splenectomy, Cure. Practitioner, 1914, xciii, 660.

29. Wolff. Milzextirpation bei Anaemia splenica infantum gravis. Deutsch. med. Wchnschr., 1906, xxxii, 2051.

30. Graff. Ueber Milzextirpation bei Anemia pseudoleucemica infantum. Verhandl. d. Deutsch. Gesell. f. Chir., 1908, xxxvii, 248 (first part).

31. Fowler, R. S. Splenectomy for Splenic Anemia. New York State Jour. Med., 1914, xiv, 435.
32. Zamboni. Anatomische Untersuchungen über Anemia splenica infantum. Riv. di Cin. Ped., 1909, x. Cited by Stettner.
33. Robertson. A study of the Hemolytic Activity of the Spleen in Pernicious Anemia. Archiv. Int. Med., 1915, xvi, 652.
34. Coupland. British Med. Jour., 1896, i, 1445.

A CASE OF YEAST (MONILIA) INFECTION OF THE LUNG.

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Through the courtesy of Dr. A. C. Harrison, of Baltimore, I was recently enabled to study a case of yeast infection of the lung which is sufficiently interesting from various points of view as to warrant its publication.

Case History. The patient, J. E. S., male, aged about thirty years, an employee of a gas company, was sent to Dr. Harrison for examination, as his health had evidently been failing for about a year. While his normal weight was 148 pounds he now weighed only about 130 pounds. He complained of becoming tired very easily, had had occasional night sweats, and cough and expectoration. He would periodically feel quite normal, however, but his cough and expectoration would then return and again persist for a variable time. The patient's appetite had not suffered; there was no diarrhea and no history of ulceration of the skin.

With the idea in mind that he might possibly be suffering from tuberculosis, Dr. Harrison sent a specimen of the patient's sputum to me for examination. This was slightly mucopurulent and free from tubercle bacilli, but crowded with yeast cells occurring either singly or in budding form. This observation was so surprising that another specimen of sputum was secured under conditions which excluded every possible chance of accidental contamination. The finding in this was the same: there were no tubercle bacilli but innumerable yeast cells. The conclusion was accordingly that the patient was most likely suffering from an yeast infection of the lung.

As the physical examination revealed nothing abnormal, in particular no rales, no dulness, and no impairment of the breath sounds, a fluoroscopic examination was made by Dr. H. E. Ashbury, who reported as follows:

"The movements of the diaphragm are equal on both sides. There is some thickening of the bronchi leading to the upper lobes. Stereoscopic pictures show a diffuse infiltration about the hilum of both lungs, extending upward to both upper lobes and involving the right middle and lower lobes. The bases are only very slightly

involved. The appearance is that of tuberculosis, showing the interweaving of the bronchial markings with some studding of small calcified bodies, giving the appearance of mottling. Much of the thickening above the hila is due to glandular enlargement. The cardiovascular shadow is normal, and gives no evidence of involvement of the mediastinal glands."

The examination of the blood showed the following: Wassermann negative. Hemoglobin, 88. Red count, 4,664,000. Color index, 0.94. White count, 6500, of which 41 per cent. were small mononuclears, 5.3 per cent. large mononuclears, 51.3 per cent. polynuclear neutrophiles, 1.3 per cent. eosinophiles, and 1 per cent. basophiles.

The urine contained neither albumin, sugar, diacetic acid, nor acetone, and showed no increase of indican. Microscopically there was nothing unusual.

Examination of the feces revealed a few small oval, budding yeast cells, such as may be found in any specimen. Their cultivation (in a single attempt) was not accomplished.

Scrapings from the tongue showed no yeast cells. From the sputum the organism in question was readily obtained in pure culture, and has now been under observation for twelve months.

In the sputum the organism occurred in torular form only. The individual cells were nearly round, the majority occurred singly, and only occasional ones were budding. Their size was fairly uniform, averaging 6 μ. Viewed with the oil-immersion lense each cell showed a round highly refractive little body, measuring from 1 to 2 μ in diameter and smaller granules. Some of the cells appeared vacuolated, and with a certain focus their outline was doubly contoured. Unstained, the cells had a greenish shimmer. Treated with Lugol's solution the torular cells assumed a faint yellowish color. With the usual methods of staining no very satisfactory differentiation of the cell contents could be obtained, as it was difficult to avoid overstaining. With a very dilute solution of safranin, however, the nucleus could be brought out in most of the cells. Spores were not observed, nor were mycelial threads seen in the sputum.

In cultures, cells were occasionally seen which carried a daughter cell of almost equal size as the mother cell, from which in turn an elongated cell was given off, and from this a short row of smaller oval cells. At the same time cells were occasionally encountered which appeared sausage shaped, measuring 12 to 13 μ in length by 2.5 μ in breadth.

Cultures on agar grew out abundantly in twenty-four hours, and were of a white, creamy appearance and consistence. In these the organism still retained its torular form, with occasional pre-mycelial types, the latter especially in cultures that had grown for a week or longer. But even after transplanting for twelve

months, at weekly intervals, the torular form predominates by far. Generally speaking the cells were for the most part smaller in the cultures than in the sputum, measuring from 3 to 6 μ in diameter, but much larger specimens were also quite common, and these usually oval, measuring 7 by 11 μ. In the cultures all the cells appeared provided with a large vacuole, which almost filled the body of the organism, and lying on top or within it a small highly refractive body.

In the young cultures most of the cells showed no buds at all: some were provided with a single bud, none with more. Several buds were only observed in old broth cultures.

On Petroff medium, containing gentian violet, a comparatively restricted growth occurred, in which numerous premycelial forms were noted.

In anaërobic stab cultures under oil, growth occurred along the line of the stab, and radiating out from this, as a central axis, large numbers of fine hair-like filaments penetrated the solid agar, so that at the expiration of about six weeks the appearance was that of a fine bushy tail in the substance of the agar. The growth first appeared while the tube was kept at incubator temperature, but later it developed at that of the room and showed a certain degree of heliotropism. Immediately under the oil a moderately dense mycelium developed with abundant lateral production of conidia. Frozen sections cut at right angles to the long axis of the cylinder of agar showed that the hair-like processes represent single mycelial threads with terminal as well as lateral bunches of conidia.

Chlamydospore-like terminal formations were occasionally encountered in the anaërobic cultures as well as on Petroff's medium.

True ascospore formation was not observed.

The hyphal threads of the mycelium were segmented.

A production of aërial hyphæ was not noted during the twelve months of observation. In plain bouillon the organism develops fairly readily, forming a granular-looking sediment while the supernatant fluid remains clear.

In liquid white of egg (alkaline) a similar growth is obtained, though it is somewhat less abundant.

Its behavior in litmus milk is especially striking. There is apparently no change during the first week or ten days, above all no acid production. After a longer period, however, there appears to be an increase in the alkalinity of the medium, while at the same time coagulation occurs; this state persists without subsequent digestion taking place.

Glucose bouillon is slightly fermented after twenty-four hours; in the next twenty-four hours this increases a little, but after that it seems to cease. Lactose, saccharose, inulin, and mannite are not fermented.

The organism is markedly pathogenic for rabbits. One animal

which had been given 5 c.c. of a bouillon culture intravenously at 11 A.M., January 17, was rendered quite ill, and was found dying early in the afternoon of January 20. At the autopsy, which was made immediately after killing the animal with chloroform, most extensive macroscopic lesions were found in both kidneys, which were studded with innumerable white nodules of pin-point size. These were confined to the cortex.

Equally striking was the appearance of the appendix. This was likewise studded with miliary nodules, which did not extend, however, macroscopically beyond the line of junction with the cecum. Microscopically, the lesions in question were essentially areas of necrosis, surrounded and partly infiltrated with leukocytes. Microscopically there was in addition the picture of an acute diffuse nephritis. In the appendicular and renal lesions the offending organism was found practically exclusively in mycelial form, while in the urine in addition to this the torular type was present in enormous numbers. In the lungs there were no lesions which were comparable to those in the kidneys and the appendix. Instead there were numerous hemorrhagic areas containing large numbers of the organism in torular form, but no evidence of mycelial production.

At the time of writing the organism has almost lost its tendency to produce mycelial forms even under anaërobic conditions, but is still pathogenic.

As regards the subsequent history of the patient I can add that following the administration of potassium iodide in full doses the cough and expectoration ceased, and that he has not only regained his former weight but has even added thereto. Apparently he is well, but whether *post hoc* or *propter hoc*, and whether or not the improvement will be lasting, it is of course impossible to say at present.

As regards the botanical position of our organism my feeling is that our present knowledge of the group of which it evidently is a member is as yet too meager to warrant any dogmatic statements. Its general biological characteristics are essentially the same as those of the organism which Bahr[1] and Ashford[2] regard as the cause of sprue, and which these writers view as monilia.

When I first discovered the organism in the sputum I was under the impression that the case was an instance of blastomycosis of the lung, but its smaller size, its disinclination to mycelial formation, its non-production of aërial hyphæ, and its marked pathogenic properties seemed to rule this out.[3] The absence of endosporulation and the very evident tendency to multiply by budding, on the other hand, distinguished it from the Coccidioides immitis of California.[4]

[1] Tr. Soc. Trop. Med. and Hyg., April, 1914, xi, No. 5.
[2] Am. Jour. Med. Sc., 1915, cl, 680.
[3] Stober: Arch. Int. Med., 1914, xiii, 509.
[4] Ibid., 1915, xv, 608.

The only other instance of monilia infection of the lung which has thus far been recorded is that of Boggs and Pincoff.[5] Their organism, it is true, gradually developed a tendency to mycelial formation, but its behavior in other respects is so similar to my own that I am inclined to regard the two as identical. Morphologically, theirs as well as my own are indistinguishable from that of Bahr and Ashford, but the evident affinity of the latter for the intestinal tract in the human being, and of Boggs and Pincoff's and my organism for the lung, would, for the present at least, warrant the separation of the two types, which might appropriately be termed monilia intestinalis and monilia pulmonalis respectively.

THE ROLE OF THE LEUKOCYTES IN VIRIDANS ENDOCARDITIS AND THE EFFECT OF NUCLEIN INJECTIONS.

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The work of the past ten years tends to lay more importance on the vital activity of the white-blood cells and their enzymes than was accredited to them during the period of enthusiastic adoption of the humoral theories. While the hopes raised by the work of Petterson, Hiss, Zinsser and others that leukocytic injections would enhance resistance in various diseases have not been fulfilled, these investigations have served the purpose of bringing out the true value of intraphagocytic and extraphagocytic bacterial destruction and the balancing of enzyme and antienzyme. The behavior of leukocytes in frank pyogenic affections is fairly well understood, but in the more chronic diseases, and those with less activity of the leukocyte-producing tissue, the subject is far from clear. The value of the leukocytes as a defense in typhoid has only lately received any approximately acceptable estimation, and in tuberculosis we know practically nothing about it. In no condition would a thorough understanding of leukocytic defensive activity be more helpful than in subacute endocarditis, a pathogenic process whose inception and continuation imply a high degree of adaption of invaders to defenses. It was with the hope of learning something

[5] Johns Hopkins Hosp. Bull., 1915, xxvi, 407.

of these phenomena and of means to increase leukocytic value that these studies were undertaken.

Subacute endocarditis is a process consisting of a local pathological lesion in which bacteria are growing and multiplying, surrounded and protected by thrombosis and vegetative masses, and whence they occasionally escape into the blood stream. The organisms in the vegetation are somewhat resistant to the defensive powers in the blood, while those in the blood stream seem to have adapted themselves completely to both serum and leukocytes. They are relatively resistant to phagocytosis *in vitro* when freshly isolated, but the blood components having to do with phagocytosis are not necessarily reduced, and may, indeed, be actually above the values for normal sera. There is no bactericidal power of any value for the body's defense.

This being the case, immunity phenomena must be found, if present, on the part of the phagocytes. The facts of the matter, as shown by Rosenow, for endocarditis with pneumococci and related organisms, and our own work with Streptococcus viridans, are that opsonins may be subnormal or slightly increased, that phagocytic value in the patient's serum is low, and low or normal in normal serum. This lowered power of leukocytes in the presence of the patient's serum, Rosenow explains by the lack of a substance in the serum, distinct from opsonin, which stimulates intraleukocytic digestion, and probably another substance, possibly derived from the microbes themselves, which render cocci resistant to consumption and destruction. To confuse the worker in this matter, great variations occur in repeated examinations. In general, in our cases, the leukocytic or phagocytic average has been fairly low, the index low, and the patient's cells could be stimulated by normal serum. The suggestions of Rosenow are, therefore, acceptable in our 3 cases of viridans infection, but this is not so in a Streptococcus pyogenes case and one due to a diphtheroid.[1]

One very interesting viridans case gave the following test:

	Per cent. of phagocytic cells.		Phagocytic average.		
(*a*) Patient's serum + normal leukocytes	18	.5	.45	.83	.9
(*b*) Normal serum + normal leukocytes	12		.54		
(*c*) Patient's serum + patient's leukocytes	9	.75	.41	.95	.8
(*d*) Normal serum + patient's leukocytes	12		.43		

While this case shows indices falling within the range of error, it is, nevertheless, evident that the percentage of phagocytic cells is greater in the case of normal ones.

A second test gave practically the same figures, but a third one, two weeks later, resulted quite differently, and gains in importance in this study in view of the fact that the patient had had four doses of nuclein under the skin in the preceding week:

[1] Zentralbl. f. Bakt., lxx, 143.

	Per cent. of phagocytic cells.		Phagocytic average.		
(*a*) Patient's serum + normal leukocytes	26.5	.72	1.975	.88	.7
(*b*) Normal serum + normal leukocytes	25.5		2.25		
(*c*) Patient's serum + patient's leukocytes	19	.86	1.56	1.13	.6
(*d*) Normal serum + patient's leukocytes	22		1.38		

It will be seen by this chart that the serum index had not improved beyond the limits of error, yet the interaction of his own combination (*c*) and the reactive number of phagocytic cells had appreciably increased. In other words, then, while the serum values have not been seriously below the control, the former low value of the leukocytes, both in the patient's and normal sera, have been replaced by higher values and the former maladjustment of patient's serum and cells has been improved. (Compare *a* and *c* and *c* and *d* on both charts.)

The sum of evidence is, then, that the serum opsonin values may be nearly normal, but the phagocytic values are subject to great variations, usually appreciably below normal.

Complement-fixing antibodies have not been demonstrable in our cases, but in two viridans infections an anaphylatoxin could be found. The details of one case are worthy of citation:

(1) Cocci 0.5 c.c. emulsion, normal serum 0.5 c.c. G. P. complement 0.1 c.c. 37° C., 1 hour.
(2) Cocci 0.5 c.c. emulsion, pat. serum 0.5 c.c. G. P. complement 0.1 c.c. 37° C., 1 hour.
Pigs (all between 240 and 275 grams):
(A) 0.9 c.c., No. 1. No evidence of injection.
(B) 0.8 c.c., No. 1. No evidence of injection.
(C) 0.9 c.c., No. 2. Died in two minutes.
(D) 0.8 c.c., No. 2. Died in five minutes.

No. 3 began scratching almost at once; in a few seconds went into anaphylactic shock. Autopsy: marked emphysema, slight congestion, but no hemorrhage in gastric mucosa. Hemorrhage the size of a pea in pericardium.

No. 4 began twitching in one minute; shock appeared later than in No. 3 but typical. Autopsy same as No. 3, but no pericardial hemorrhage.

Subacute viridans endocarditis is, then, in all probability, a process due to a high pathogenicity locally, without bactericidal serum property, the circulating of bacteria and their anaphylatoxin and a lowered phagocytic power. The bactericidal effect is probably not missed, because antisera with this power are apparently of no value (Horder). Opsonins are powerless to stop the process because they can be raised by bacterin injections, with but little or no effect upon the disease. We are compelled, then, to investigate further the role of the phagocytes and the possibility of increasing their efficiency.

Phagocytosis is a process completed by the mutual relation of

chemotactically positive substances and cellular adequacy. It would appear from the work of Marchand, Bail, Rosenow, Gruber and Futaki and others that certain organisms in the process of active parasitism, whether due to virulence, capsule, aggressins, or what not, are distinctly difficult of consumption by phagocytes. Such seems only slightly true of Streptococcus viridans as normal serum and leukocytes, or even infected serum, will act upon them, there being, therefore, no antichemotactic power but probably antiopsonic power, which, as has already been cited, is accredited by Rosenow to some unisolated serum component. This may possibly be serum protease, for, as an anaphylatoxic state exists, this substance could be greater than normal (if one accept the theory of Jobling and his co-workers). At all events an anaphylactic condition is associated with leukopenia, and while we may not have a reduction of leukocytes in viridans infection, there is at least a very definite inadequacy of their phagocytosis and possibly of their number. Possibly they are kept busy supplying some neutralizing body for the antiopsonic power of the bacteria. It was recognized by Friedberger that in diseases like typhoid, where anaphylaxis can be shown, there is a lowered chemotaxis and a low leukocyte count; such conditions are said to respond to bacterial injection by a rapid and pronounced leukocytosis (Gay and Claypool). Unfortunately this does not occur satisfactorily in viridans infection, and we shall have to use other than bacterins for leukocytic stimulation.

Leukocytes respond to the liberation of protein of any kind, but especially of nucleoprotein; in other words, nucleoprotein has a pronounced chemotactic power. This is well shown in the leukocyte accumulations around bacterial bodies, dead or alive, or when the cells themselves have undergone destruction. This property has been thought of many times and use made of it in injecting nucleins to produce leukocytosis. The clinical use of this substance has fallen into disrepute for several reasons, the best probably being that it has not been thoroughly studied. We have repeated many of the old experiments with the hope of learning more of its properties and to see if it can be of value in viridans infections. The old controversy as to the value of increased leukocytes alone and their content of antibodies, while far from a complete settlement, does not affect the case.

In reviewing the literature germane to this subject we find no experimental or clinical work on the use of nuclein in viridans endocarditis, nor indeed, except bacterins, of anything which is supposed to act upon the leukocytes. The literature on nuclein in its theoretical value and practical therapeutic use, is relatively limited, most of the articles dating from the period in which there was an active controversy about the source of the bactericidal power of the blood. Vaughan, Buchner, and Hahn believe that

they increased the resistance of experimental animals to the introduction of various germs when nuclein was administered either before or after the organisms. Vaughan, having isolated the constituent of normal serum to which he ascribed natural protection, and finding it undigested by pepsin, believed it to be nuclein. Then there followed the dispute as to the origin of antibody and complement, a matter now on a working basis, although not settled. Whether or not leukocytes produced either or both, the results of the work of Petterson, Hiss, Mainwaring and others indicate clearly that some bactericidal power is to be found in the white blood cells and their extract, substances rich in nuclein. The act of phagocytosis is not sufficient to destroy parasitic organisms, and, as is shown by Neufeld and Rosenow, phagocytosis and intracellular destruction do not go hand in hand. Phagocytosis is due to appropriate chemotactic relations, while digestion is due to intracellular enzymes. The failure to complete both functions in every case is not understood. A persistent high number of leukocytes is indicative of a high resistance to organisms which have the chemotactic activity to call forth the cells; but it would seem that in subacute infections there is, despite the fairly high leukocyte count, an inadequacy on the part of the digestive intracellular power. Whether or not a great increase in white cells will supply this power, and whether or not nuclein could be the inciting agent for this purpose, are facts to be settled. The power of nuclein to produce an increase of leukocytes has long been known, and is ascribed in its therapeutic use to Horbaczewsky, a name mentioned by two writers, but we fail to find the original article.

The information about nuclein in the literature may be considered from three stand-points: how nuclein acts, the number and character of the leukocytes in the blood after injection, and the therapeutic effects. The opinion held by most observers is that nuclein exerts a distinct chemotactic effect on the leukocytogenic organs with the appearance of new cells. Others, notably Mendel, consider the new cells as appearing in response to destruction of old ones, this being due to the nuclein introduced. Still others believe there is a squeezing out of leukocytes from tissue spaces by contraction of involuntary muscles, which follows a subsidence of internal vasodilatation, a condition of the vessels shown by Mendel. There is less divergence in the observations upon the kind and number of circulating white cells. Nearly all authors find a decrease in total cells, followed by an increase, and most of them note an increase of the small lymphocytes and decline of the polymorphonuclear neutrophiles. We shall show that this is only a percentage increase and decrease. It is historically interesting to mention that Ames and Huntly cite a primary increase in the lymphocytes as a high percentage of young forms, whereas later the adult or polynuclears are increased. Pankow expressed little faith in

nuclein, believing the effect to be due to saline solution; this we shall see is erroneous. The experimental and clinical therapeutics of nuclein begin as far back as 1892 by Löwitt, then by Vaughan in 1896, after which no one seems to have worked much with the substance until the period 1903 and 1907, during which time several articles appeared. The most noteworthy of these are three coming from the Mikulicz Clinic by Mikulicz, Miyake, and Renner. They found that by the use of yeast nuclein they could increase the resistance of experimental animals to artificial infection and could materially reduce the morbidity and mortality from postoperative peritonitis. They lay stress on the fact that they could get greater protection and greater number of leukocytes (20 to 8) by the use of nuclein than by the use of aleuronat, which they class as a mechanical attractor of leukocytes. Renner, experimenting with dosage in human beings, used 50 c.c. of a 2 per cent. solution, which means 17 mg. per kilo for a man of 70 kilo. There was usually a mild general reaction and a local puffy, sensitive swelling at the site of inoculation. Their own description of the after effects is not in harmony with their nonchalance as to the severity of the reaction. Judging by the reaction we observed in dogs, this injection must be painful. According to Renner, the reaction on the part of the leukocytes takes place anywhere from six to twenty-four hours later, and one cannot foretell when it will appear or when the effect or the decrease will be greatest. The leukocyte increase is usually pronounced, being in his highest case 452 per cent. They say that this procedure, while of distinct clinical value, is not effective against fulminating streptococcal infections.

THE INTERPRETATION OF CERTAIN BLOOD-PRESSURE RATIOS.

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During the past ten years blood-pressure determinations have apparently become an essential part of the data necessary in many instances to an understanding of conditions affecting the circulatory system. In this period much of value has been acquired from blood-pressure studies. It will be the purpose of this article to interpret certain phases of the subject, although it is realized that in the words of a contemporary, "It is not difficult for the majority of us to be beyond our depth before we know it, when we venture in these waters."[1]

[1] McCrae, T.: Am. Jour. Med. Sc., April, 1916, in review of Sir Clifford Allbutt's Diseases of the Arteries, Including Angina Pectoris.

TYPES OF ARTERIOSCLEROSIS AND THEIR INFLUENCE UPON HYPERTENSION. From the beginning of blood-pressure determinations it has been apparent that not all types of rigid arteries were associated with hypertension. In fact, it is a matter of common observation that extreme sclerosis may exist with normal or decreased pressures. A review of the various types of arteriosclerosis may therefore be of interest at this point in an endeavor to correlate subsequently in this article various types of vascular disease with arterial pressure variations, and their clinical manifestations.

The Nodose Type of Arteriosclerosis. This is the most common form, and is characterized by whitish, flattened, and nodal thickenings of the intima. These thickenings or nodes are especially noticeable at points where smaller branches are given off from the larger arteries, such as the intercostal branches of the aorta. The aorta is, however, usually involved throughout the entire length. These nodes are the result of true hyperplasia of the connective-tissue cells of the intima, and are not the result of round-cell inflammatory infiltration. The nodes are non-vascular and may subsequently undergo localized necrosis, the so-called atheromatous ulcers, the areas of which are replaced by granulation tissue with eventual calcification and atheroma. The characteristic change is calcification and atheroma of localized patches or nodes of intimal connective-tissue overgrowth.[2] [3]

This type of arterial degeneration is not, as a rule, associated with hypertension, since the localized patches when present do not cause material contraction of the lumen of the smaller vessels.

The Senile Type of Arteriosclerosis. This type, the so-called "Moenckeberg's Sclerosis," is characterized by muscle atrophy and degeneration of the media. The muscle atrophy of the media is more important than atrophy of the elastic tissue. Compensatory overgrowth, or hypertrophy of the intima, may occur with subsequent atheroma of these areas of intimal overgrowth, or, as more frequently happens, sacculation and dilatation of the larger vessels, such as the aorta occurs, due to localized giving way of the intima. Calcification and fibrosis of the media is the essential change. This may involve the smaller vessels also, which are rigid. Savill[4] has shown in a report of 400 autopsies on individuals of an age of sixty years or over that an extensive patchy atheroma was consistent with an average longevity and absence of cardiovascular symptoms. Of course, if the patches of intimal overgrowth happen to involve the orifices of the coronary arteries the nutrition of the myocardium will suffer and will be followed by cardiac symptoms,

[2] Adami, J. G.: The Nature of the Arteriosclerotic Process, AM. JOUR. MED. SC., October, 1909.

[3] Adami and McCrae: A Text-book of Pathology, 1914, p. 487.

[4] Lancet, London, 1904, p. 506.

the variety of which will depend upon the degree of obstruction. If conditions producing "hypertonus" as described by Russell[5] have been present during the time the fibrosis of the media was progressing, it is conceivable that contraction of the peripheral vessels would occur with exaltation of arterial tension. As a rule, however, the senile type of arteriosclerosis is not accompanied by marked hypertension, for while the peripheral vessels are generally rigid they are not contracted, and hypertonus appears to be lacking.

Toxic Type of Arteriosclerosis. In this type the plaque-like nodes or patches of the intima have a translucent appearance and may resemble the nodose type, but the essential change is an inflammatory degeneration of the media. The initial nodes are more spread out and occur characteristically in groups especially in the ascending aorta and arch. These nodes are the result of a compensatory hypertrophy, but there is little tendency to calcareous change and atheroma, as in the nodose type. The toxic type of arteriosclerosis is essentially inflammatory and is seen particularly as a result of the toxins of syphilis, diphtheria, diabetes, and after lead and mercurial poisoning. The toxin of syphilis leads especially to intimal overgrowth, the nodes having a puckered appearance, with their long axis transverse to the long diameter of the vessel. In syphilis the vasavasorum of the first portion of the aorta are particularly affected, and round-cell infiltration occurs about their branches in the adventitia and media. The toxins of typhoid fever seem frequently to have an ill effect upon the intima of the peripheral arteries, the manifestations of which are to be seen in patches of overgrowth. The diphtheria toxin particularly affects the media.

In chronic degenerative diseases affecting the permeability and function of the kidneys the characteristic arterial changes of the toxic type are seen. In addition, hypertonus seems to go hand-in-hand with so-called chronic glomerulonephritis. It has been generally believed that the degenerative media changes in the arteries are brought about by the increased pressure resulting from disturbed kidney function and that ultimately contraction of the arterioles occurs.

Leonard Hill has shown that increased pressure in the larger trunks normally causes the arterioles to contract, and that the higher the pressure the more the arterioles tend to contract. It is this tendency to contraction of the lumen of the arterioles in this type of arterial degeneration which distinguishes it from the types before mentioned. The diastolic pressure is in consequence higher in this group. Allbutt[6] apparently believes in the hypertonus factor described by Russell, for he has protested against the use of the term arteriosclerosis as a disease *per se*. He believes that the arterial degenerative changes may occur as a result of any cause producing

[5] Arterial Hypertonus, Sclerosis and Blood-pressure, Edinburgh, 1907.
[6] Brit. Med. Jour., October 20, 1906.

high pressures. Savill[7] and Russell[8] have been able to demonstrate an increase in the muscular coat of the smaller arteries accompanying arterial degeneration in the larger trunks. This hypertrophy, they believe, implies abnormal contraction. This is in accord with the belief of Hasebroek[9] that contraction of the arteries is an active muscular act to assist the heart in maintaining an adequate pressure for blood flow, while dilatation of the arteries is a passive result of the injected volume of blood during systole. Adami and McCrae[10] have expressed their belief as to the relationship between hypertonus and arteriosclerosis as follows: "We support the view that arteriosclerosis as such is not in general of infective origin, and indeed is not an inflammatory process. We hold that it is the expression of a disordered relationship between the internal pressure to which the artery is subjected and the strength of the arterial wall, that strength depending in the main upon the condition of the media."

THE AUSCULTATORY METHOD OF PRESSURE DETERMINATIONS. Both systolic and diastolic pressures are best taken by auscultation, with a stethoscope of the disk type, over the brachial artery on the inner aspect of the arm below the compressing arm band. Korotkoff[11] first described this method in 1905. In applying this method, compression is made in the arm band to a point above which all sound is heard in the artery. The air-pressure is then gently released, and as the pressure falls the point at which the first sound is heard is taken as the systolic pressure. A series of similar clear sounds are then heard which are soon replaced by a series of murmurs, and a second series of clear sounds. These clear tones are shortly replaced by dull tones which rapidly disappear. Korotkoff believed that the diastolic pressure corresponded to the first dull tone following the second series of clear sounds. This is, as a rule, about 5 mm. above the point of disappearance of all sound.

Latterly, Hooker and Southworth,[12] using the Erlanger instrument in combination with the method of Einthoven and Geluk for recording brachial sounds, have expressed the opinion that for clinical purposes the point of cessation of sounds in the artery corresponds with the diastolic pressure. I have taken the dull tone following the second series of clear sounds as indicative of the diastolic pressure, but am inclined to believe, with further experience, that in the majority of cases of rapid heart action this transition is exceedingly difficult to determine. It would undoubtedly simplify the procedure if the point of disappearance of pulse sound was taken as the diastolic pressure. Further experience will probably show the wisdom of adopting this point, since for all practical accuracy it answers the purpose.

[7] Tr. Path. Soc. of London, vol. lv.
[8] Loc. cit.
[9] Deutsch. Arch. f. klin. Med., 1911, cii, 567.
[10] Loc. cit.
[11] Mitt. d. k. mil. med. Akad. zu St. Petersburg, 1905, xi, 365.
[12] Arch. Int. Med., 1914, xiii, 384.

THE SYSTOLIC PRESSURE. For nearly a decade after the estimation of blood-pressure became a matter of clinical interest, attention was largely directed to the systolic pressure. The literature to about 1910 in fact mentioned but rarely any other than the systolic pressure. The usual method was to determine the point of palpatory obliteration of the pulse wave distal to the compressing arm band. The auscultatory method has, however, greatly simplified the accuracy of blood-pressure readings, and has gradually supplanted the palpatory method. The systolic pressure may be defined as the sum total of pressures existing in the artery under observation during cardiac systole. It is made up of the diastolic pressure existing in the artery during the cardiac pause or diastole plus the pressure or force exerted by the contracting ventricle in excess of the diastolic pressure. This latter, known as the pulse-pressure, represents the expenditure of force necessary to move the column of blood in the artery. It represents motion through the expenditure of kinetic energy. During systole, as the intraventricular pressure rises, the aortic valves do not open until the pressure at least equals the pressure then existing in the aorta, *i. e.*, the diastolic pressure. The ultimate or total pressure reached must be considerably in excess of the diastolic pressure, for if such a result were not attained at the end of systole there would be no pressure effective to promote blood movement. The pulse-pressure then represents the effective *vis-a-tergo* promoting blood movement. The pressure exerted by the cardiac systole up to the moment of opening the aorta valves avails the circulation nothing at all. It is, so to speak, kinetic energy wasted in overcoming static or potential energy. It is therefore the sum of the diastolic and pulse-pressures which go to make up what has been recognized as the systolic pressure.

The systolic pressure represents the total expenditure of kinetic energy on the part of the myocardium necessary to effect blood movement at a given moment. It represents heart work and is relatively a variable force, since the circulatory requirements may have considerable variation, dependent upon emotions, such as anger or anxiety, apprehension and nervous unrest, and upon physical stress and exertion, which may for the time being draw upon the cardiac reserve strength. It is a much more variable pressure than the diastolic pressure. An increased systolic pressure from this point of view means an increased cardiac expenditure of energy and nothing more, while a decreased pressure represents less expenditure of cardiac energy. The height of the systolic pressure in a compensated heart is dependent upon the height of the diastolic pressure (*i. e.*, the arterial tonus) to a large degree. But an increased systolic pressure may also depend upon certain factors, such as liver cirrhosis, mediastinal growths, pleuritic effusions, aortic aneurysm or incompetent heart valves, not necessarily associated with arterial hypertonus, but making necessary the expenditure of extra force in an endeavor to promote circulatory equilibrium.

THE DIASTOLIC PRESSURE. The diastolic pressure represents the more or less constant potential or static pressure existing in the artery under observation during the diastolic pause between succeeding systoles. The chief factor affecting this pressure is the tonus and degree of elasticity of the arterial wall. Of probably less importance is blood volume and viscosity. The following distinction may be made that while the total or systolic pressure represents cardiac force the diastolic pressure represents the resistance offered by arterial tonus. The diastolic pressure consequently should be taken as the index of arterial tension. A high diastolic pressure therefore means hypertension irrespective of the height of the systolic pressure, and *vice versa* a lowered diastolic pressure means hypotension, irrespective of the systolic pressure.

In an examination of over 500 individuals, for the most part below the age of forty years, who presented no symptoms of circulatory disease, I have found that the average diastolic pressure was between 80 and 85 mm. Hg. A persistent diastolic pressure of 100 signifies, in my experience, a mild degree of arterial hypertonus. If this pressure persistently averages 110 a more definite hypertonicity is present and usually signifies the beginning of an advancing vascular disease with contracted arteries. If a diastolic pressure of 115 to 130 is maintained persistently, definite vascular contraction has occurred. To this there are few exceptions. There have been occasional instances in which arterial hypertonicity of a temporary duration has occurred, due to toxemia, the result of a temporary hyperglycemia, or urea retention (as in acute nephritis). In these instances of temporary duration the diastolic pressure has fallen as the cause has been relieved.

When the diastolic pressure is maintained at a high level, from 130 to 160, the conditions are present which have so long been associated with contracted kidneys. The associated kidney disturbance is but an evidence of the vascular changes, the hypertonus and constriction, present throughout the circulatory tree. It does not follow nor has it been proved that the primary cause of the hypertonus is the result of altered kidney function. The kidney damage is probably coincidental to the vascular damage inflicted elsewhere through metabolic factors many times unknown, producing hypertonicity and constriction of the arteries. The essential point is that the diastolic pressure is the true index of arterial tension.

THE PRESSURE-RATIO.[13] With a heart possessing normal contractility and tonicity, so far as one may judge in the present state of knowledge, there exists within certain limits a normal ratio between

[13] In earlier papers dealing with this subject the term heart-load was used to designate the increased ratio between pulse-pressure and diastolic pressure found in the cardiac groups. Such a term while suitable for the cardiac groups is inadequate for the cerebrorenal group of hypertension, for while the ratio between pressures is usually within normal limits in this group when the heart is compensated, the heart-load or work is necessarily increased because the heart is contracting against an increased diastolic pressure. The term pressure-ratio is therefore to be preferred.

the diastolic and pulse-pressure. As has been before mentioned it is the sum of these pressures which make up the total or systolic pressure, so for practical purposes the systolic may for the time being be disregarded. In a study of about 500 individuals with supposedly normal hearts I have noted that the pulse-pressure averaged about 50 per cent. of the diastolic pressure. That is, with a diastolic pressure of 80 mm. the pulse-pressure was an additional 40 mm.; with a diastolic of 82 mm. the pulse-pressure was 41 or 42 mm.; while with a diastolic of 90 mm. the pulse-pressure was 45 mm. The normal pressure-ratio was therefore formulated as follows:

THE PULSE-PRESSURE DIVIDED BY DIASTOLIC PRESSURE or $\frac{\text{P. P.}}{\text{D. P.}}$

The ratio here given merely expresses the fact that under normal conditions, as well as in certain abnormal states in which the heart is in compensation, a pulse-pressure force 50 per cent. in excess of the diastolic pressure is required by the heart in systole before the aortic valves open and mass movement of blood is affected toward the periphery. The ratio also expresses the relationship between the kinetic energy expended by the cardiac contraction in moving the blood column and the potential energy or resistance offered by the arterial walls and volume of blood which they contain. This ratio may vary within normal limits between 40 and 60 per cent. The tendency toward this ratio is always evident with compensating hearts in pathological states with true hypertension due to an increased diastolic pressure (*vide infra*). In such cases, as the diastolic pressure increases due to vascular contraction and rigidity representing a true obstruction to cardiac output, the pulse-pressure increases, due to the expenditure of increased cardiac force in the endeavor to adequately supply the periphery with blood. The systolic pressure is consequently increased when the diastolic pressure is high if the heart is compensating for the increased circulatory load it is obliged to carry.

Strassburger[14] first attempted in 1905 to obtain a pressure-ratio as a means of estimating cardiac efficiency founded upon pressure variations. His ratio was obtained by dividing the pulse-pressure by the systolic pressure.

Tigerstedt[15] has also suggested this formula for determining the efficiency of the heart as a pump. His formula takes into account the factor of blood velocity as follows:

$$\frac{\text{Pulse-pressure} \times \text{pulse-rate} = \text{velocity}}{\text{Systolic pressure} \times \text{pulse-rate} = \text{work}} = \text{heart efficiency.}$$

$$\text{This is equivalent to } \frac{\text{pulse-pressure}}{\text{systolic pressure}} \text{ or } \frac{\text{P. P.}}{\text{S. P.}}$$

This formula appears objectionable for the following reasons: When the intraventricular pressure rises during cardiac systole

[14] Quoted by Barach and Marks, Arch. Int. Med., 1914, xiii, 648.
[15] Quoted by Hirschfelder, Diseases of the Heart and Aorta, 1910, p. 26.

the aortic valves cannot open until this pressure at least equals the diastolic pressure in the aorta. The intraventricular pressure up to this point does not affect blood movement at all, it being the pressure exerted by the myocardial contraction in excess of the diastolic pressure, *i. e.*, the pulse-pressure, which is useful for the purpose of blood movement during the cardiac systole. It therefore appears that the ratio of pulse-pressure to a diastolic pressure should be taken as an expression of the measure of work done by the myocardium in overcoming peripheral resistance.

THE DIFFERENTIATION OF CERTAIN TYPES OF HYPERTENSION. In applying the formula here given to a considerable number of patients manifesting symptoms of vascular disease it became at once apparent that certain groups could be differentiated. The differentiation depended to a large degree upon the height of the diastolic pressure and the relationship which this pressure appeared to bear to the pulse-pressure.

THE CEREBRORENAL GROUP OF HYPERTENSION. In this group were found the patients with evidences of damage to the arteries in general and to the kidneys in particular. When the damage had been long sustained the diastolic pressure was persistently high, and if the heart were able to compensate for the obstruction offered by the higher diastolic pressure the systolic pressure was increased in practically normal ratio. This group comprised those patients with chronic nephritis of the so-called diffuse or interstitial variety. Polyuria was practically always present. The quantity passed at night was increased. The specific gravity was low, varying between 1.005 and 1.015. Periodically abundant casts were found and serum albumin was present. Such damaged kidneys, as is well known, have difficulty in excreting urinary solids, and the tendency to urea retention in the blood was always marked. If the protein food intake was in excess of 75 to 100 grams daily the tendency to urea retention would many times produce an aggravation of the symptoms. This tendency was evident in many patients who followed a careful diet and whose daily intake of protein would not exceed 50 grams.

The main subjective symptoms were dyspnea usually on exertion, a feeling of pressure in the head frequently referred to the back of the neck, weakness, restlessness at night and unsatisfying sleep, vertigo, early morning headache wearing off by noon, mental confusion or lack of the usual initiative and ability for concentration. Retinal and subconjunctival hemorrhages occurred in about 10 per cent. of the patients. The diastolic pressure, as before mentioned, was high, varying from 120 to 165, while if the heart was able to compensate for the obstruction offered by the increased diastolic pressure, the systolic pressure was high also. The ratio, as before expressed, between the pulse-pressure and the diastolic pressure was in an average of many readings taken in 42 cases, usually within

the normal limits of 40 to 60 per cent. The average age of these patients was fifty-five years. The average systolic pressure was 200, the diastolic 132, the pulse-pressure 68, while the pressure-ratio was 51 per cent. Twenty deaths have occurred in the series of 42 patients, giving a mortality of 48 per cent. within the three years of observation. In this group of 42 patients observed over the past three years the nephritic damage appeared to be but part of the general vascular pathology. The kidney manifestations appeared to be incidental to the general changes, which may be designated under the heading of Vascular Disease. The kidney symptoms and the high diastolic pressures which accompanied secondary contraction of the kidneys appeared to be the result of unknown metabolic factors producing hypertonus and contraction of the peripheral arteries. These vessels were rigid, but they were also contracted and their lumen diminished. Such must have been the case or the diastolic pressure would not have been so persistently increased.

I have believed from earlier observations, as well as from this series of 42 cases, that the danger to such patients because of the high diastolic pressure lay more particularly in cerebral accidents such as hemorrhage or thrombosis or cerebral edema. The mode of death in the majority has convinced me that such is the case. I have therefore designated such patients under the cerebral or cerebrorenal group of hypertension, although the general term vascular disease covers the ground more adequately.

Cardiac symptoms were many times prominent features in such patients. In the majority of the patients of this group, cardiac hypertrophy had occurred as a result of increased work in pumping against the increased diastolic pressure. The laryngeal edema leading to a constant desire to cough, the dyspnea which was many times distressing, the edema of the extremities and of the base of the lungs and the gallop rhythm pointed to cardiac disturbance. Such cardiac manifestations seemed to occur because of myocardial fatigue, and in such instances the pressure-ratios showed alteration due to a decreased pulse-pressure. This resulted in a lower systolic pressure while the diastolic was less affected. This seemed to occur because of inability due to fatigue to furnish an adequate amount of pressure or force in excess of the diastolic pressure to affect normal blood movement and stasis resulted. In such instances decreased urinary output usually was present and the symptoms due to increased retention of urea in the blood occurred. When an efficient digitalis preparation was administered at the time of such symptoms two purposes were secured: (1) the heart acquired increased tonus and force, and (2) diuresis was stimulated. The systolic pressure soon approached its former normal high level and the diuresis washed out the retained urea from the blood.

A certain proportion of patients in this group, 10 per cent,

(2 out of 20), have died as the result of myocardial exhaustion, but the much larger proportion clinically suffered cerebral hemorrhage or thrombosis and edema as a part of what we have for so long considered to be uremia. Whether a cerebral or a cardiac death is more likely to occur would seem to depend to a large degree upon the localization of the vascular degeneration. The degree of degeneration does not seem to be the same throughout the arterial system. In one patient the cerebral vessels may have suffered more than the coronary. Much may depend upon the condition of the vessels from the effects of some previous disease, as syphilis or the acute infections, such as typhoid or rheumatic fever. Syphilis, as is well known, seems to have a predilection for the aorta, the aortic orifice and by contiguity the coronary orifices.

From the stand-point of pathological physiology the kidneys in this group have difficulty in excreting urea and non-protein nitrogen products of metabolism. Few of these patients die in anuria, however. There has always been evidence of some ability to excrete water unless obstruction had existed, such as an enlarged prostate or uterine fibroid pressing upon the ureters. From the anatomical stand-point thrombosis of, or hemorrhage from, the cerebral vessels frequently occurred. The two processes altered kidney function and cerebral vascular structure often appeared to go hand-in-hand.

From the stand-point of prognosis it appeared that the higher the diastolic pressure the greater was the danger of a cerebral death.

The Cardiac Group of Hypertension. The second group which was differentiated by the study of the blood-pressure ratio was the cardiac group. In this group, while the systolic pressure was in some instances as high as in those of the cerebral group, the diastolic pressure was, as a rule, but little higher than the normal. The pulse-pressure was in consequence much higher than normal and the ratio of pulse-pressure to diastolic pressure was much increased. An average of the systolic pressures in the 32 patients of this group was 178 while the diastolic average was 93. Instead, therefore, of a normal variation in the pressure-ratio of 40 to 60 per cent. the ratio was increased to 92 per cent. This increased load over the normal limits stamped the cases as cardiac. This group was largely made up of those patients manifesting cardiac symptoms without the clinical evidences of vascular disease and its associated nephritis. It comprised those with damaged valves, with aortic sclerosis, dilatation, or aneurysm, with liver cirrhosis, with gouty manifestations, with emphysema, with syphilis or an earlier history of lead poisoning, and those whose lives had been given to hard physical labor calling for unusual cardiac demands. The symptoms of nephritis were usually lacking in the patients of this group. Such albumin as was found occasionally to be present in the urine could be attributed to stasis. The symp-

toms, such as polyuria, the tendency to blood-urea retention, the low specific gravity, the showers of casts were conspicuous by their absence.

The main subjective symptoms were fatigue on exertion, anginoid pains in the chest, cardiac arrhythmias due to ventricular extrasystoles or auricular fibrillation, palpitation, and dyspnea. The heart was hypertrophied in about half of the cases and likewise the peripheral arteries were rigid to palpation, but *the essential feature was that the smaller arteries, although rigid and sclerotic, were much contracted or the diastolic pressure would have been increased.* The distinctive feature of this group was the low diastolic pressure as compared with the cerebrorenal group.

The increased pressure-ratio was maintained in the patients of the cardiac group with little variation, as a rule, while the heart muscle was in compensation. In fact, in many instances the early signs of decompensation were associated with a falling systolic pressure, the so-called "primary high, secondary low" sequence. Death occurred in most instances with the symptoms of a gradually failing heart muscle or, more explicity, the symptoms pointed to a cardiac death. The systolic pressure was high in this group when the heart was in compensation, because the arterial tubes were rigid and did not passively dilate during systole to accommodate the increased blood flow into them caused by the cardiac contraction.

The prognostic point of value in the cardiac group of patients seemed to be in the maintained height of the systolic pressure as an evidence on the part of the myocardium of compensation for increased work. A falling systolic pressure in the cardiac group of hypertension was of evil augery. It usually signified varying degrees of cardiac dilatation.

On the whole the prognosis was better in this group than in the preceding cerebrorenal group, with much higher diastolic pressures. Of the 32 patients, of an average age of sixty-two years, 8 have died within three years of observation, giving a mortality of 25 per cent. All have died a clinical cardiac death with one exception, in which the death may have been cerebral and in which autopsy was not permitted. In the patients of the cerebrorenal group there was not only the danger of cerebral hemorrhage, or of cerebral thrombosis and edema incident to the development of uremia, but also the possible danger of cardiac failure which occurred in about 10 per cent. of the deaths in that group. In the cardiac group the danger appeared to be entirely cardiac and the deaths which occurred, with possibly one exception, were due to gradual myocardial exhaustion or, more acutely, with dilatation and pulmonary edema, or to angina pectoris. The patients of the cardiac group appeared to be better risks for anesthesia by ether or by nitrous oxide-oxygen than those of the cerebrorenal group with high diastolic pressures.

THE PRESSURE-RATIO IN ANGINA PECTORIS. In angina pectoris so much apparently depends upon the patency of the coronary orifices and the rigidity or absence of thrombotic obstruction to the coronary arteries, as well as the condition of the root and the first portion of the aorta, that little might be expected from a diagnostic stand-point from the study of blood-pressure variations. I have at hand repeated observations covering 15 patients studied during the past six years; 8 are living and 7 have died in an attack. The average age of the living is now fifty-nine years, the average age of the seven who died was sixty-one years at death. There were 9 males and 6 females. The average systolic pressure of 14 of these patients was 179 and the average diastolic pressure 100. The pressure-ratio average was 80 per cent. The highest systolic pressure observed was 250 while the highest diastolic pressure was 140. The lowest systolic pressure was 115 and the lowest diastolic pressure was 40, which occurred in a patient with aortitis and dilatation with relative aortic regurgitation from stretching of the aortic ring. The average age of the 9 males at the time of their first attack was fifty-eight years, while the average age of the 6 females at the time of their first attack was sixty years. The youngest patient was forty-two at the time of his first attack while the oldest was seventy-three. Two of the patients, 1 male and 1 female, died suddenly during their attack from rupture of the posterior wall of the left ventricle into the pericardium. The walls of the ventricles showed evidences of an earlier hemorrhagic infarction about the points of rupture. Osler in the Lumleian Lectures of 1910 before the Royal College of Physicians mentioned one patient in whom the systolic pressure rose to 340 mm. during an attack of angina. I have come to regard with relatively greater seriousness the angina patients who have normal or subnormal systolic and diastolic pressures. Those in my experience who have had exalted blood-pressures have survived the longest.

THE PRESSURE-RATIO IN CARDIAC LESIONS WITHOUT HYPERTENSION. This group comprised those patients with cardiac lesions whose systolic and diastolic pressures were not increased. It was made up of 20 patients with average systolic pressures of 118 and average diastolic pressures of 62. The pressure-ratio was therefore increased from the normal of 40 to 60 per cent. to 90 per cent. The greatest increase was found in 6 patients with aortic regurgitation. Their average systolic pressure was 140 while the average diastolic pressure was 40. The pressure-ratio was therefore greatly increased to 250 per cent. In no other chronic cardiac conditions with which I am familiar were so low diastolic pressures encountered as in aortic regurgitation. This point appeared to have diagnostic significance in the differentiation of cardiac murmurs.

In considering prognosis in cardiac lesions without hypertension from the stand-point of the pressure-ratio many instances were

observed in which a greatly increased ratio appeared to be compatible with a few subjective symptoms of decompensation. This was to be expected, since the greatly increased pulse-pressure was evidence that the myocardium was able to furnish adequate force to affect blood movement in compensation for the valvular disability. When the cardiac force became inadequate as the result of dilatation due to stress or overexertion, possibly from no more apparently serious an incident than severe paroxysms of coughing in an attack of bronchitis, the pulse-pressure was decreased and the symptoms of cardiac incompentency developed. This clinically signified dilatation, and has been observed in 16 patients. There was but little change in the diastolic pressure when cardiac dilatation occurred. The most evident change was the fall in pulse-pressure which produced a lower systolic pressure. The pressure-ratio was therefore diminished, the extent of which seemed to bear a direct relationship to the degree of myocardial embarrassment. In these 16 patients the pressure-ratio at the time of such disturbance varied from 11.5 per cent. to 30 per cent. When the systolic pressure tended to approximate the diastolic pressure the danger of cardiac failure was increased, since there was apparently insufficient force during systole to much more than overcome the diastolic pressure in the aorta, with but little pulse pressure useful to the movement of blood. As a result the cardiac and respiratory centers in the medulla suffered, and at the moment when insufficient blood supply reached them the exitus occurred.

The Pressure-ratio in Myocardial Exhaustion Due to Acute and Chronic Illnesses. In an acute illness, such as pneumonia, erysipelas, septicopyemia, or the early stage of typhoid, the diastolic pressure has a tendency to fall 5 to 10 mm. below its former level, due in all probability to the relaxing effects of the absorbed toxins, either upon the arteries directly or upon the vasomotor center. This results in an increase in the pulse-pressure and the pressure-ratio, for during the early stages of an acute infection the systolic pressure is usually sustained at or near its normal height. At least this usually occurs if the heart is capable of normal response. When the stage of heart embarrassment is reached in an acute illness, either from an abnormally high rate or perhaps from exhaustion in the endeavor to maintain the increased pulse-pressure apparently necessary to supply the periphery with blood, the systolic pressure begins to fall. The pressure-ratio is in consequence decreased. This decrease has appeared to bear a definite relationship in a considerable number of instances to the other clinical evidences of cardiac exhaustion. For example, in a patient ill for about two weeks with typhoid fever the systolic pressure was 118, the diastolic 80, the pressure-ratio 48 per cent. He developed bronchopneumonia the following day and the systolic pressure was 115, the diastolic pressure 60, the pressure-ratio 92

per cent. The following day the systolic pressure was 128, the diastolic pressure 102, and the pressure-ratio had fallen to 25 per cent, which was considered a serious sign. Stimulation in the form of caffein was administered in an endeavor to produce a corresponding rise in systolic pressure. The pulse rate was at this time 140 to 160. Six hours later the systolic pressure was 80 and the diastolic had fallen to 55. One hour before death the systolic was 80 and the diastolic 50. The pressure-ratio was, of course, of less prognostic importance than the fall of the systolic and diastolic pressures.

Numerous instances of this type could be given. In some of the instances a fairly good ratio between the pressures was maintained until very near the end under the influence of strophanthin intravenously, Nativelle's digitoxin, caffein, pituitrin, or adrenalin. The subsequent fall in pressures sometimes occurred very rapidly; in fact, the advisability of administering such marked cardiovascular stimulants has been questioned seriously in my mind in such instances upon the basis that it is possible, although one may not say probable, that exhausted heart and vessel tonus might have lasted longer had not the whip been applied so vigorously near the end of the race. This much may be said: when the diastolic pressure falls the vessel tonus has diminished; if the systolic pressure is maintained at near its normal level the heart is doing increased work because of the increase in the pulse-pressure, its ability to thus perform increased work depends upon its unknown reserve strength; should the systolic pressure begin to fall approaching the diastolic pressure the outlook is bad.

I have seen only one individual recover in an acute illness in which only ten to twelve points separated the systolic and diastolic pressures. In this instance a strong man suffered a mania at about the time his convalescence appeared to be established in typhoid. The systolic pressure during a few moments of quiet was 98 and the diastolic pressure was 88. He eventually recovered. One more instance of acute infection may be cited. A patient suffering with acute gangrenous stomatitis (Vincent's angina) and septicemia had early in her illness a systolic pressure of 120 while the diastolic pressure was 80. Five days later the diastolic pressure had fallen to 60 while the systolic pressure was maintained at 120. Two days later, with a pulse-rate of 140 to 148, temperature 103° to 104° (axillary), the diastolic pressure had fallen to 40 and the systolic pressure to 105. Death occurred about twenty-four hours later. She had taken 30 c.c. of a tincture of digitalis, the strength of which had been standardized by the cat method of Hatcher and Eggleston, during four days with no demonstrable effect.

In surgical shock in individuals with supposedly strong hearts the diastolic pressure was usually low. This was evident in repeated instances, especially if severe hemorrhage had occurred. The systolic pressure was usually maintained within normal limits so long

as the heart was able to sustain the greatly increased pulse-pressure, a fact in accord with the often repeated observation of Hürthle "that with a decreased peripheral resistance there is an increase in the pulse-pressure." Such increased work did not, of course mean increased output of blood moved by the heart toward the periphery, for the heart was pumping into more or less empty vessels if severe hemorrhage had occurred, or if venous stasis had resulted in the splanchnics. Its output was diminished because of lowered venous pressure on the right side of the heart while its futile work was increased until the point of exhaustion was reached when a fall in the systolic pressure occurred.

Crile in a preliminary note about twelve years ago mentioned the rise in systolic pressure which usually occurred with the onset of peritonitis. He did not refer to the diastolic pressure. In several instances which I have observed the systolic pressure was increased during the development of peritonitis and the diastolic pressure was also increased. For example, in a patient with acute miliary tuberculosis and intestinal perforation in which operation was not advised the systolic pressure was 120 and the diastolic 105 twelve hours after the perforation. Fourteen hours later the systolic pressure was 130 and the diastolic 110. Eight hours later the systolic pressure was 145 while the diastolic was 110. Sixteen hours later (four hours before death), with evidence of a rapidly failing heart and pulse-rate of 160, the systolic pressure was 98 and the diastolic pressure 85. The two pressures were approaching each other and the heart had apparently not much more force behind it in systole than was necessary to open the aortic valves against the diastolic pressure.

Peritoneal handling, incident to surgical procedure without peritonitis, has produced a rise of both the systolic and diastolic pressures in several patients. One example may be given to emphasize that such pressure changes do not necessarily mean peritonitis, for such might be suspected from leakage after certain operations. A young man with continued uncontrollable slight bleeding from a gastric ulcer had a systolic pressure of 120 and a diastolic pressure of 90. The following day gastro-enterostomy was done. The systolic pressure rose shortly thereafter to 150 and the diastolic pressure to 115. The day following the systolic pressure was 140 and the diastolic 110. His recovery from the operation was uncomplicated.

In chronic illnesses not associated with symptoms of vascular disease, which necessitated confinement to bed, such as organic diseases of the central nervous system, the systolic and diastolic pressures were usually within normal limits until the heart muscle began to fail. At such a time the systolic pressure began to fall and approached the diastolic pressure, the significance of which was not difficult to anticipate. Any marked fall in the diastolic pressure may not occur until near the end, at which time and in

some instances for twenty-four hours preceding it may be difficult, if not impossible, to secure definite pressure readings.

In the chronic severe anemias, whether secondary or primary, without evidences of cardiovascular disease, the systolic pressure was lower than normal for the age, while the diastolic pressure was markedly decreased. An average of the systolic pressures of 8 primary anemia patients with red blood counts varying from 728,000 to 1,000,000 per c.mm. was 105, the average of their diastolic pressures was 52. Such lowered diastolic pressures would be expected because of the thinner blood volume and relatively empty vessels. The pressure-ratio average in these patients was increased to 102 per cent.

CONCLUSIONS. From a study of over 150 patients manifesting various degrees of vascular disease and cardiac disability certain types of blood-pressure variations have been noted. The types for the most part may be grouped under the following heads:

1. *The cerebral or cerebrorenal type of hypertension*, which comprised those patients with vascular disease in which there were evidences of damage to the arteries in general and to kidneys in particular. A cerebral death occurred in a large proportion of these patients and the unfavorable prognosis seemed to depend upon the height of the diastolic pressure. In the patients of this group the arteries were rigid as well as contracted.

2. *The cardiac type of hypertension*, which comprised those patients without evidences of vascular disease and its associated nephritis. Death usually occurred from myocardial exhaustion. The arteries were rigid, but not contracted, or the diastolic pressure would have been increased. The prognosis seemed to depend upon the ability of the heart to sustain the increased systolic pressure as a purely compensatory measure.

3. *The Cardiac Type without Hypertension but with Increased Pressure-ratio.* This group comprised valvular and myocardial lesions which necessitated increased cardiac work. The prognosis seemed to depend upon the ability to sustain an increased pressure-ratio. Death when it occurred was due to myocardial exhaustion.

4. *The Cardiac Type without Hypertension but with Decreased Pressure-ratio.* This group comprised those patients with cardiac dilatation or those in whom marked evidences of myocardial exhaustion had occurred. The prognosis seemed to depend upon the reaction of the heart to stimulative measures in the endeavor to increase the pressure-ratio.

5. In general, it may be concluded from this study that too much reliance should not be placed upon blood-pressure variations as a guide to the condition of the circulation in any particular case, for such variations are of value only when associated with all other data. Certain groups of patients may, however, be differentiated in the manner above outlined, such differentiation possessing definite diagnostic and prognostic value.

VINCENT'S ANGINA.

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Certain anginas have been described by Plaut and Vincent as due to two organisms, one a fusiform bacillus and the other a spirillum, the two forms being considered either as stages in the life of one organism or as an example of symbiosis. The pathogenicity of these is still questioned in general, but especially often in particular. The difficulty of culture has prevented more frequent recognition, since smears are too rarely made. The ultimate test, namely, animal inoculation, has been remarkably unsuccessful.

The author once obtained from the peritoneal cavity of a sputum-injected mouse a smear which was typical for the average throat, and included Vincent's organisms. Pneumococcus Group II was obtained from the heart's blood. These results were never duplicated.

As to the occurrence of these organisms in general:

Berkeley speaks of their occurrence in healthy throats.

Bennerdoin found them in 64 per cent. of 227 cases of diphtheria, 73 per cent. of scarlet fever cases, 50 per cent. of streptococcic sore throats, 50 per cent. of cases of stomatitis, 67 per cent. of 31 cases of syphilis, 58 per cent. of 43 healthy cases.

Wingrave, who found them present in 80 per cent. of normal individuals, says they are frequently in nose discharges, in sinuses, in the tympanic cavity, etc. He denies their pathogenicity in man.

In 100 individuals having healthy throats, smears were made by the author, and in 43 per cent. Vincent's organisms were demonstrated. These individuals included nurses, patients, orderlies, doctors, and dispensary cases.

Leo Green speaks of Vincent's angina as occurring after measles, scarlet fever, whooping cough, and diphtheria. The late stages of severe cases are in reality the disease called noma. He reports an epidemic in a children's hospital as caused through the medium of a spoon.

Holstead reports it as a known specific cause of laryngitis, bronchitis, bronchopneumonia, mastoiditis, gangrene, ulcers of the penis and genitalia, abscesses, and general pyemia.

Tunnicliff and Wright report two cases of this variety of angina: the ulcerative or common form, and another the membranous or diphtheritic form. This is rare, occurring in 2 per cent. only of Rolleston's cases. In this latter form the bacillus alone occurs.

Rolleston considers the ulcerative as only the later stage. It would seem improbable, though not impossible, that were these organisms, which are found so frequently together in ulcerative conditions of the throat, purely saprophytic, in certain rare cases

one should appear to precede the other. It would seem that they represent stages of one organism, certainly the spirillum never appears alone, and the bacillus always develops first on culture media.

Green cured five cases with salvarsan, a known spirillicide. Unfortunately we do not know the effects of salvarsan in general in throat cases.

In the cases on which this article is based, smears stained with gentian violet were used in all. The diagnosis was made in three by a dark-ground illumination. In all smear-taking the necrotic material itself was obtained, as far as possible exclusively, and smeared. In one case an emulsion of this was injected into a mouse without result.

Of the 12 cases to be reported, 4 were individuals from whom smears had been taken previously in the study of healthy throats. Of these, 2 showed Vincent's organisms when in a healthy condition, and later suffered from a disease apparently due to these organisms. One showed it previously, but a later sore throat was streptococcic; and one having a smear negative for Vincent's previously, later developed a Vincent's follicular tonsillitis.

Case I.—C. J., angina, malaise. Temperature never over 99.4°. Deep ulcer under white necrotic mass. A diagnosis of syphilis was made. By dark-field illumination from smear following alcoholic application for one minute, and taken with the blood, motile spirillæ were seen varying somewhat in number and sharpness of curves, but all showed few and low curves. Bacilli were also seen. A smear showed the two organisms described by Vincent. The ulcer remained after all signs and symptoms had disappeared.

Case II.—Mr. M.; stiff neck first, four days later slight soreness in throat; never any other symptoms and never any fever. Left tonsil showed irregular white mass over easily bleeding ulcerous surface. A few white spots were on the other tonsil. White mass was hillocky and came off in pieces. Dark-ground examination of smear showed spirillæ as in Case I. Smear showed spirillæ and bacilli. Ten days from beginning the tonsil showed some white covered ulcers, but there were no general or local symptoms.

Case III.—Miss H.; sore throat; patches on right tonsil; headache. Temperature, 104°; malaise. Removed membrane. In two days better; fever down. On the fifth day after going out there were some general symptoms. Right tonsil showed follicular tonsillitis. Smear negative. Next day the tonsil was more covered; dirty white masses easily removed. Seemed like food particles. Dark-ground illumination showed a few spirillæ. Bacilli frequent. Diphtheria organism negative. Throat hardly sore. Temperature, 99°. Deep in tonsil was a white based ulcer with an intense red margin. The eighth day showed same throat condition without symptoms.

CASE IV.—H. S.; child, aged five years. Illness began with swelling of lower jaw on the right side. Third day later found a large, white, irregular patch on the left tonsil. Right tonsil showed enlarged white follicles. Diphtheria antitoxin given as precautionary measure (6000 units). Temperature as high as 102°.

Fourth day was better. Membrane unchanged. Temperature, 102°.

Fifth day the membrane was unchanged. Temperature, 102°.

Sixth day the membrane was smaller; spots on right tonsil. Temperature, 102°.

Seventh day the membrane was much smaller. Temperature normal. Spots nearly gone.

Ninth day there was no trace of membrane.

Smear here showed almost exclusively Vincent's organisms. Diphtheria organism negative. Membrane was multicolored, dirty, high, irregular, rather loose, and a foul ulcer underlay it.

CASE V.—Miss A. T.; nurse. Previously throat was positive for Vincent's organisms.

First day the throat was sore and swollen on the outside; not sore inside. Temperature, 98°.

Second day was the same. Temperature, 99°. Throat sore inside, (evening). Both tonsils showed thick, irregular white masses over ulcerated bases. Smears from white masses showed Vincent's organisms. Diphtheria organism negative.

Third day the soreness was greater. Temperature, 100°. (5000 units of antitoxin).

Fourth day the throat was a little better. Temperature, 100° at 8 A.M. and 101° at 8 P.M.

Fifth day was much better; throat swollen. Temperature, 99° at 8 A.M. and 100° at 8 P.M. Ulcers unchanged.

Sixth day was much better. Ulcers still present. Temperature at 8 P.M. 99.4°.

Seventh day the ulcers were less marked.

CASE VI.—Miss S.; aged twenty years; nurse. Sore throat off and on for two weeks. Headache, malaise, etc.

First day the temperature was 102°.

Second day the temperature was 102.8°. Right tonsil showed three white patches, one far behind the pillar. Smear showed both organisms of Vincent's, especially bacilli.

Third day she felt well. Temperature was normal. Throat was unchanged.

This case showed characteristic lack of paralleling clinical signs and pathology, also predominating bacilli as in membranous type.

These six cases certainly suffered from diseases having the fundamental points in common:

1 Characteristic serious-looking ulcers with characteristic membranes.

2. Symptoms, especially sore throat, mild out of all proportion to pathology.

3. Return to perfect subjective health a considerable time before ulcer disappeared.

4. Predominance in each case of organisms described by Vincent.

5. In two by special therapy and in three by special diagnostic technic, diphtheria and syphilis were respectively ruled out.

The following cases are not typical or characteristic:

CASE VII.—H. W.; aged nineteen years. First day had sore throat; the membrane on both tonsils was soft and easily removed. Smear showed long rods in preponderance; no spirillæ.

Second day the temperature was 103°. Culture showed staphylococci.

Fourth day the membrane was gone. Temperature was normal. Smear showed a few typical spirillæ. This case included because of the characteristic picture in the first smear suggesting the bacillus of Vincent. The predominance of rods agrees with the assertions concerning the diphtheroid type of Vincent's angina.

CASE VIII.—D. W. Young girl, aged sixteen years.

First day had fever, chills, bone pains, sore throat, follicular tonsillitis. Temperature was 101°. Pulse, 120. Patches developed on enlarged tonsils, later small white spots on cheeks, gums, and tongue. These had red areolæ. From careful smears of the centers, practically, exclusively, Vincent's organisms were found.

Twelfth day was about well.

The following cases with Case 5 are taken in connection with the routine examination made previously for normal flora.

CASE IX.—Bertha; three weeks before a routine smear was negative for Vincent's.

First day had sore throat; malaise.

Second day the temperature was 102.4°. Tonsils were large and covered by large gray areas; pink bordered. Smear from membrane showed Vincent's organisms predominating. Diphtheria bacilli negative.

Fifth day was better. Temperature was normal. Tonsils were large; gray patches present. Injected mouse with emulsion of membrane without result.

Seventh day the membrane had disappeared.

Eighth day, bouillon culture of streptococci from throat injected into mouse without result.

CASE X.—Miss N.; aged twenty years; nurse. Two weeks previously Vincent's organisms were found. Used hydrogen peroxide as gargle t. i. d. for one week.

First day had sore throat. Smear (general) showed Vincent's organisms. Smear of membrane showed only streptococci.

Second day the temperature was 103.6°.

Third day the temperature was 102°.

Fourth day the temperature was 98.4°. Membrane unchanged.

CASE XI.—Miss M.; three weeks previously found Vincent's organisms.

First day the throat was irritated.

Third day had sore throat. Temperature, 103°. Tonsil showed white spots.

Fourth day the temperature was 100°. Tonsils large. Spots very small. Smear showed Vincent's organisms.

Evidently Vincent's organisms, frequently normally present, may be found in the general throat smear and at the point of disease, or only in the general smear, or only at point of disease.

Under the usual cultural conditions employed in laboratories making routine twenty-four-hour reports, a positive or negative diagnosis of diphtheria as based on the growth of the bacillus pure or predominating can be made. The value of such a diagnosis depends upon the degree of accuracy with which a portion of the membrane from the throat is removed by a practitioner, retained upon the swab without contamination, and directly applied to the blood serum.

Practically all, as is well known, contain staphylococci and streptococci. Staphylococci or streptococci cultured pure or nearly so from a piece of membrane, especially if its surface is previously cleaned, may be considered as pathogenic for the case.

Smears from a membrane often give a much more definite diagnosis, as lurking contaminating organisms cannot cloud the picture.

Reports of staphylococcal or streptococcal growths from swabs received indiscriminately would appear to be of no value. The same conditions hold for other organisms more rarely seen in the throat pathology, which are culturable on ordinary media.

Vincent's organisms cannot be cultured by the ordinary methods (aërobic). The small percentages, less than one, reported of Vincent's organisms in routine work are probably made from smears of material from throats applied to the surface of media in especially large masses, but they are not growths.

By smears a diagnosis can easily be made. A large percentage of normal throats contain these organisms, as in the case of streptococci, but by careful differential smearing a conclusion can be reached as to the bacterial content of the membrane. In the case of mailed swabs there is nearly as much a question as to diagnostic value, as in the case of streptococci and staphylococci. However that may be, such a diagnosis would be much more frequently made than is usually imagined.

Certainly in many serious-looking anginas if the causative organisms are not those of Vincent's, at least the predominance of the latter in the picture of a smear, appear to be a sure guide to a diagnosis of great importance, prognostically and economically. Until by animal inoculation or special therapy their pathogenicity is

repudiated or substantiated, the sooner this guide is properly sought for the sooner will an important advance be made in this branch of medicine.

REFERENCES.

Berkeley. Med. News, May 27, 1905.
Green. Northwest Med., February, 1914.
Leo Green. New York Med. Jour., September 6, 1913.
Halstead. Lancet-Clinic.
Halstead. Tr. Am. Laryngol. Assn., 1912, p. 216.
Tunnicliffe. Jour. Infect. Dis., January, 1912.
Rolleston. British Jour. Child. Dis., 1910, vii.
Vincent. Annales de l'Institut Pasteur, 1896.
Plaut. Therap. Gaz., 1911, xxxv.
Wingrave. British Med. Jour., January-June, 1909, p. 184.
Wright. Lancet, July 9, 1904.

SOME FACTS AND FALLACIES CONCERNING ABDOMINAL ADHESIONS AND BANDS.

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Philadelphia.

With the continued development of abdominal surgery there has been an increasing appreciation of the importance of the normal activities and pathological conditions of the peritoneum. The recognition of gross lesions of this structure, such as the more evident forms of active peritonitis and the resultant inflammatory adhesions, antedates by far our knowledge of the conditions giving rise to them. The demonstration of the bacterial origin of peritoneal lesions and subsequent investigations as to the causation of such bacterial invasions have placed our knowledge of the more acute forms of peritoneal disease upon a firm basis.

A far more difficult problem presents itself when we consider peritoneal adhesions and bands for which it is impossible to ascertain a definite antecedent acute inflammatory lesion. The recognition of such structures is not a recent one. It has been stated that Virchow, in 1858, was the first to describe these structures more in detail, but at that time, of course, there was no basis for a correct opinion concerning their causation. For a long time after the beginning of abdominal surgery upon a larger scale the avoidance and treatment of acute peritonitis engrossed the attention of operators. Further and extended observation of early cases led to information concerning postoperative and postinflammatory adhesions and to efforts to determine their cause and to attempts at their prevention. A still later development of the matter was

an endeavor to understand the symptomatology and diagnosis of abdominal adhesions as apart from other lesions.

Finally the work of such men as Jonnescu, Lane, and Treves, several decades ago, called the attention of surgeons to the existence of various folds, bands, and membranes in relation to portions of the gastro-intestinal tract and to their possible importance. It remained for J. N. Jackson, in 1909, to bring to a definite standing in our minds the significance of certain pericolic structures or membranes, and following him many investigators and clinicians have endeavored to place upon a firmer basis our knowledge of this subject.

A great deal of confusion which exists concerning all these adhesions, bands, membranes, etc., may be obviated by the clearer grasp of certain fundamentals, and an effort to distinguish between various groups and varieties of these structures, instead of attempting to make one theory as to their causation explain every case.

All abdominal adhesions and bands may be grouped into two classes:

1. Those adhesions and similar structures whose character and location make it evident that they must have been the result of a definite attack or attacks of peritonitis of more or less severity.

2. Those structures in which some doubt may be entertained as to their formation as the result of a distinct peritonitis.

The former class gives us more data upon which to form a conclusion; the latter is the one about which the discussion among surgeons at present centers. Jackson himself has stated that he is in the dark as to the causation of the membrane named after him or Jonnescu; others have been more definite in statements as to their opinions.

Membranes and adhesions not frankly the results of a peritonitis may be again subdivided into:

(*a*) Structures whose character and location make it possible that they may be the results of fetal maldevelopment.

(*b*) Similar membranes in localities in which this causation is not so plausible.

The explanation of the existence of both of these types has been attempted upon numerous grounds. Briefly, they are:

1. The attempt to explain all or most of these formations on the basis of failure of the rotation or descent of the gut or an anomalous growth of the peritoneum and mesentery in the presence of normal rotation. While there may be some basis for this assumption in certain cases, it has appeared more than a coincidence to us that these bands or veils with their attendant symptoms should be so often localized at or near that portion of the gut where we are most likely to have lesions of an inflammatory nature. Nor is it a counterbalancing fact that there is not to be found the remaining proof of such an inflammation.

Eastman, in experiments on rabbits, by artificially producing coprostasis, has succeeded in producing a low-grade peritonitis and subsequent formation of membranes. Cheever is one of those who dissent most strongly from this view of the matter, and his dissections somewhat strengthen his position. Nevertheless the experiments mentioned and those of Murphy and others on intestinal obstrucion lead us to the belief that in many cases a migration of bacteria through the intestinal wall can and does give rise to diffuse peritoneal inflammation of a low grade which results in the formation of veils, membranes, and bands.

It is a remarkable fact that these structures are most often found in adult life and at that time give rise to symptoms. Is not this also an evidence that an early underlying cause gives rise to conditions which cause their symptoms later, when the membrane or other structure becomes of such extent as to seriously interfere with the activity of the gut?

Granting at once that certain of the structures might possibly be the results of causes unassociated with inflammatory changes, there is no evidence that this is the case, and it is far more reasonable to suppose them the results of an inflammation until the reverse is proven.

2. Mr. Arbuthnot Lane and others (Fagge, etc.) have attempted to explain peritoneal bands as "crystallization of lines of force," and the result of stress upon normal structures causing them to be altered. There is no doubt that malposition of abdominal viscera must bring with it a malposition of their surrounding structures and coverings, but the whole of Mr. Lane's explanation of these conditions is surrounded by a haze of theory, argument, and supposition unsupported by facts. His theories are curious and interesting, but entirely unconvincing; plausible on first reading but not susceptible of close reasoning. Some of his views and statements do not bear analysis at all; their true inward meaning must be known only to Mr. Lane himself. To explain a definite and often pathological structure upon such vague and fanciful grounds does not tend to clarify the situation; it only introduces an additional mystery to a difficult subject.

3. In contradistinction to these views there are those who would explain practically all of these new or malformations of the peritoneum as the results of inflammation. It is a matter of no great consequence that many of these adhesions or bands are or seem to be congenital. The evidences of antenatal inflammation of the peritoneum are sufficiently definite in numbers of reported cases (Doran, Kieth, Ballantyne, and Veszprenit). It is the opinion of these men that such instances of fetal peritonitis as they cite are by no means uncommon, and the examples given are those in which there was no evidence of a purely mechanical origin of the peritonitis such as a perforation. The transmission of toxins and drugs from

mother to fetus is universally acknowledged, as is the transmission of the infecting agents themselves by means of the blood or indirectly through the fetal appendages (Burnet).

Since then the existence of not infrequent antenatal peritonitis is proven, we believe that those adhesions which are found not to have been caused by a peritoneal inflammation after birth are the result of a similar condition in the fetus; that whereas many of these adhesions are congenital they are not developmental in origin. It must be understood that from such an origin we exclude those instances in which there is but an accentuation or simple enlargement of a peritoneal membrane, fold or process normally present.

In taking inflammation, acute or subacute, as a causative factor of a condition, we are dealing with a fundamental entity, a condition with the results of which we meet every day. In assuming developmental errors as causative factors of lesions evidently pathological, we can only adopt the absence of other demonstrable causes as proofs of a supposed cause.

A consideration of the opinions of various clinicians and experimenters makes evident the fact that there is no agreement concerning these bands of membranes.

Fallon even states that Jackson's membrane is always present, and is a normal structure. With this view we are not at all in agreement. Lynch, after citing certain facts to prove that Jackson's membrane is not of inflammatory origin, concludes "that the membrane described by Jackson is of embryonal origin, but it may be so altered by inflammation as to appear like an ordinary adhesion." It may be embryonal and nevertheless inflammatory, and to distinguish between a membrane of inflammatory origin—antenatal or postnatal—and a membrane merely altered by an inflammatory process appears to us to be impossible.

We think there is every reason to believe that practically all of these structures are the result of peritoneal inflammation of some kind; and, moreover, we are convinced that more extended clinical observation on the part of those who have had greater opportunities to theorize about than to observe these formations can only serve to make them agree with this opinion.

Concerning adhesions which are frankly the result of one or more attacks of peritonitis after birth a great mass of literature has been accumulated. We believe that the fact is often lost sight of that such adhesions are principally an effort of nature to effect a cure or to limit infection. The various attempts, hitherto unsuccessful, to avoid such adhesions in inflammatory cases we believe to be efforts in the wrong direction. On the other hand, in clean cases in which infection plays no part, it is essential that by minimizing handling and exposure of the viscera we avoid the formation of adhesions of no value and possibly of great harm.

In conclusion, we would merely mention the increasing recognition

of the importance of abdominal adhesions, and our progress in their diagnosis is especially by means of the roentgen-ray. A less pleasing subject for our contemplation is our inability effectually to deal with such adhesions when they do exist and cause symptoms.

BIBLIOGRAPHY.

Jackson. Ann. Surg., 1913, lvii, 374.
Eastman. Surg., Gynec. and Obst., 1914, xviii, 228.
Cheever. Jour. Am. Med. Assn., 1913, lxi, 248.
Murphy, etc. Boston Med. and Surg. Jour., 1911, clxv, 684.
Arbuthnot Lane. Proc. Royal Soc. Med., 1913, vi, 49.
Doran and Keith. Proc. Royal Soc. Med., 1913–1914, vii, Obst. and Gynec. Sect., p. 261.
Burnet. Proc. Royal Soc. Med., 1913, vi, Obst. Sect., p. 264.
Fallon. Boston Med. and Surg. Jour., 1913, clxix, 609.
Lynch. United States Naval Bull., Washington, 1915, No. 1.
Vesprenit. Beitr. z. Path. Anat., Jena, 1914, lx, 124.

THE TREATMENT OF SYPHILIS OF THE CENTRAL NERVOUS SYSTEM WITH INTRASPINAL INJECTIONS OF MERCURIALIZED SERUM.

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Until recently the treatment of syphilis of the central nervous system was not essentially different from that of syphilis elsewhere in the body. Because of this, results in these cases have been far from satisfactory.

Since the discovery that the Spirocheta pallida are the active agents and are found viable in the tissues and exudates in the so-called parasyphilitic diseases, the tendency has been to consider these cases merely cerebrospinal syphilis and to lose sight of the finer anatomical localizations. This also is in part due to the rapid advance in our laboratory methods.

Ravaut was the first to call attention to the diagnostic importance of a meningeal reaction in the very earliest stages of syphilis, which was too slight to be detected in any other way, except by the examination of the cerebrospinal fluid. Udo Wile, in this country, has been very active in substantiating this work of Ravaut's. This can mean only one thing—that the central nervous system is involved in the early stages in the majority of cases. Systemic treatment here is usually quite efficacious, even though there may

be an extensive meningitis, with headache and other functional disturbance.

Later, however, the changes in the central nervous system and its envelopes are more chronic and yield less readily to medication.

In the different anatomical types of nerve syphilis, such as the interstitial, the parenchymatous, and the essentially vascular, treatment will or will not yield results, depending on the accessibility of the diseased region to the medication. In the interstitial type, which includes meningitis luetica, meningo-arteritis, and gummata, the results from systemic treatment have been good, because symptoms arising therefrom have been functional and depend on the amount of exudate and pressure, the resolution of which often yields brilliant functional results. When, however, the nerve tracts or centers have been destroyed, full restoration of function cannot be expected.

In the parenchymatous type, which includes the so-called parasyphilitic diseases, irritation and destruction of nervous elements seem to be the essential features. Here, results of systemic treatment have been somewhat disappointing, except when the irritative symptoms have been due to active inflammatory processes.

The seat of the active lesion in most cases of tabes, namely, radiculitis, probably explains why some cases yield to the treatment better than those of general paresis, in which the spirochete and round-cell infiltration are scattered throughout the cerebral cortex.

Swift says of this: "The separateness of the dorsal roots may result in greater accessibility to the remedial agent, and it is conceivable that if all the radicular nerves and dorsal ganglia were gathered in one area, as in the cerebral cortex, the arrest of tabes might be as unsatisfactory as is the treatment of paresis."

Before the advent of salvarsan, treatment of nerve syphilis with mercury was far from encouraging because there were so many relapses. The present drift of opinion is that in the exudative, inflammatory, gummatous, and arterial forms, salvarsan is by far the most efficient remedy we possess. Schaller, as early as 1912, states in his conclusions that "the relief obtained from one intravenous injection of salvarsan appears to be temporary in the majority of cases."

Since large and more frequent doses have been given there are fewer neurorecidives and fewer relapses.

The use of salvarsan, which at first promised to yield such brilliant results, has in many cases, even with prolonged treatment, not given the expected results.

Just why was this? One or two answers suggest themselves—either irreparable changes had taken place in the nervous system or the drug failed to reach the seat of infection. Careful chemical investigations of the cerebrospinal fluids have shown no trace of

arsenic after the intravenous administration of neosalvarsan, and only very slight traces after salvarsan.

Swift and Ellis, in this country, conceived the brilliant idea that the administration of a salvarsanized serum into the subarachnoid space itself would possible alter some of the local conditions which were evidently not reached by intravenous administration.

The results of their studies are manifold. Reports of patients who were quickly relieved began to appear. Some observers questioned the efficacy of the method, arguing that the cause of the improvement in clinical symptoms was the intravenous administration, and not its local application, and that the improvement in the cerebrospinal fluid findings was due to the withdrawal and subsequent dilution of the remaining fluid by the injected serum. Sachs, Strauss, and Kaliski have shown that up to forty-five minutes after the administration of 0.6 gm. salvarsan intravenously, only from 0.00004 to 0.0001 gm. of metallic arsenic could be detected in 20 c.c. whole blood; after forty-five minutes practically no free arsenic could be demonstrated.

Other workers, especially Marinesco and Ravaut, injected unchanged neosalvarsan in aqueous solution into the subdural space, but the reactions were severe and the results doubtful.

Great caution has to be exercised in the use of these unstable arsenical preparations, because of their irritative and toxic properties. This was shown in the very unfortunate circumstance which happened on our coast some months ago.

Ravaut, in 1913, had treated two cases of cerebrospinal syphilis with injections of mercurial salts into the subdural space, with marked improvement. Neither case had been followed more than a few weeks. Byrnes, in 1913, believed that many patients who were receiving the Swift-Ellis treatment were also being actively treated with mercury. In those patients who were receiving mercury, especially the inunctions, the presence of mercury (0.0000059 gm. per c.c.) could be demonstrated in the serum, an amount equal to the salvarsan content of salvarsanized serum, so that these patients were receiving a mercuralized as well as a salvarsanized serum.

Byrnes used, in general, the Swift-Ellis technic for the preparation and administration of the serum, except that no drug was administered before withdrawing the blood.

The preparation of patients and technic of administration of the serum in the cases reported below are essentially that of Byrnes' original procedure.

1. For one week the patient is given full doses of mercury, preferably 1 dram of the ointment inuncted every night.

2. Forty c.c. blood are collected in dry sterile centrifuge tubes. The blood is centrifuged immediately and then placed in a

refrigerator for eighteen to twenty-four hours when it is again centrifuged for fifteen or twenty minutes and 18 to 20 c.c. serum are pipetted off.

3. One c.c. of a solution of mercuric chloride in distilled water, which contains $\frac{1}{5^{1}0}$ of a grain of bichloride, is added to the serum.

4. This prepared serum, which should be perfectly clear, is then heated at 56° C. (132° F.) for half an hour.

5. A lumbar puncture is performed. Spinal fluid is removed until the pressure reads about 30 mm.

6. The prepared serum is slowly administered by gravity, at body temperature.

7. The patient is placed in a bed, the foot of which is elevated eight inches, for four hours.

8. Liquid diet is ordered.

9. Morphin sulphate (gr. $\frac{1}{4}$) is prescribed if necessary.

Difficulty in getting clear serum which contained no hemoglobin was encountered at first, but since all apparatus used is perfectly dry, there have been no severe reactions, which will be described in one or two of our earlier cases.

For determining the efficacy of this method I have determined to apply it for certain indications, only general paresis and in tabetics suffering from lancinating crises in the legs. Since gastric crises may be due to causes extra spinal, *i. e.*, disease of the sympathetic, it was decided not to treat tabetics with the latter manifestation as the only complaint by this method.

Twenty-five patients have been treated by this method in the last seven months—125 injections form the basis of this report. On an average, 5 injections were given each patient. One to two weeks' interval elapsed and all reaction had entirely subsided before a second injection was given in any case. A report of the more interesting cases follows. In all there were treated: Erb's syphilitic spastic spinal paralysis, 2 cases, 6 injections; general paresis, 3 cases, 15 injections; tabes dorsalis, 20 cases, 104 injections.

The luetin was done on patients having had no potassium iodid before or during the test. Detailed report of the most instructive cases follows.

Case I.—Erb's syphilitic spastic spinal paralysis.

E. H., aged forty-one years; German. Entered the San Francisco Hospital September 24, 1914, complaining of inability to walk.

The patient had had gonorrhea in 1903 and a primary sore in 1908. The onset of his present trouble dated from 1912, with paresthesia of the buttocks, as if he were sitting on something cold. Pain in the left ankle soon followed. Six months later he suddenly lost the use of both legs. This lasted seven months, when slight power returned so that he could get around with the use of two canes. One year later a relapse occurred. During this time he was given five salvarsan injections and many mercurial rubs. No

marked improvement. Examination at this time showed a spastic paraplegia with marked weakness of the quadriceps extensor and the peroneals. The adductors were spastic.

Slight deafness in the left ear; pupils equal and react actively to light.

Reflexes: Knee-jerks, right and left, both exaggerated. Ankle-jerks exaggerated.

Babinski positive, right and left. Right superficial abdominals left.

Bathy anesthesiæ of both big toes. No marked sensory involvement elsewhere.

Marked pains encircling lower abdomen were present. Much incontinence of urine, especially at night.

Merc. serum.	Date.	Cerebrospinal fluid.			Wassermann.			Reaction.	Remarks.
		Pressure.	Cells.	Albumin	Blood.	C. S. F.	Luetin.		
I	Mar. 27	280	200	+	−	−	+	To 104° vomit headache	Bloody serum.
II	May 19	?	80	Slight	−	−	−	None; temp. 102°	Better control of urination; pains disappeared.
III	June 17	130	38	−	−	−	−	No reaction; temp. 100°	Complete control of urine. No pains.

The reaction was very severe after the first treatment, due to contamination of the serum, with hemoglobin. This patient after the second injection had no further girdle sensations or pain in the legs. The bladder gave much less trouble. He, however, has no better use of his legs since the treatment.

CASE II.—*Tabes dorsalis.*

H. M., aged forty-nine years; electrician.

Entered the San Francisco Hospital July 1, 1915, complaining of general weakness and dizziness.

Gonorrhea and probable chancre thirty-three years ago. Some alcoholism. Onset of present illness occurred about fifteen years ago, when the knees began to give out. This was followed by a dead feeling in the legs, with inability to walk in the dark. Early fatigue was marked. Severe pains in the legs and around abdomen supervened which were present on admission. Patient had been a sufferer from biliousness for many years.

Examination showed marked bilateral deafness (catarrhal?).

Argyl-Robertson pupils; punched-out scars on shins.

Hypesthesia of the legs; absent knee and Achilles jerks. Ataxic gait; Romberg positive.

Bladder crisis and polyakiuria.

Blood Wassermann negative; luetin positive.

Merc. serum.	Date.	Cerebrospinal fluid.			Wassermann.		Reaction.	Remarks.
		Pressure.	Cells.	Albumin	C. S. F.	Blood.		
I	July 24	?	5	+	+++	− − −	Very slight	Bladder, pain still continues.
II	Aug. 8	185	18	+	−	Luetin +	Very slight	Band-like sensations around abdomen. No pain—biliousness.
III	Sept. 5	135	8	−	− − −	−	No reaction	Weakness. No pain.
		No previous treatment						
IV	Oct. 10	140	4	−	− − −	−	No reaction	None.

CASE III.—*Tabes dorsalis.*

W. H., carpenter; aged forty-eight years.

Entered Hospital July 23, 1914, with "rheumatism."

Neisserian infection; 1901, painless sore on penis at same time.

Moderate use of alcohol. Excessive tobacco.

Onset of present illness in 1902, with staggering in the dark.

Marked attacks of nausea and vomiting, with loss in weight and pains in legs.

Examination showed Argyl-Robertson pupils; loss of knee-jerks and ankle-jerks; extreme ataxia and positive Romberg.

Anesthesia of skin of legs and about nipples.

The patient was given two doses of Salvarsan, and mixed treatment, which always disagreed with him.

Fraenkel movements were instituted with good results.

Blood Wassermann + + +.

Merc. serum.	Date	Cerebrospinal fluid.			Wassermann.		Luetin	Reaction
		Pressure.	Cell.	Cell.	C. S. F.	Blood.		
I	Mar. 28	?	31	?	+ + +	+ + +	+ + +	Marked gastric crisis.

Crisis lasted seven days; two small ones since for short time.

Ataxia improved; no pains. Patient had a mild gastric crisis three days one month later.

CASE IV.—*Tabes dorsalis.*

R. W., aged forty-five years, machinist.

Entered hospital December 9, 1914, because of pains in legs and inability to walk.

Gonorrhea and chancre in 1885; no secondaries.

Onset of symptoms, 1907, with numbness in legs followed by staggering at night, especially. Shooting pains in the legs developed. No girdle sensation at first. In the last two years condition became extreme, so that he was taking opiates about 1 grain per day. During this same time patient had four full doses of salvarsan and continuous mercurial treatment.

Examination showed extreme ataxia, positive Romberg; absent knee and Achilles jerks; Argyll-Robertson pupils.

Loss of pain touch and temperature sensibility in legs and abdomen. Hypercryalgesia in the back.

Fraenkel movements were started January 2, 1915, but discontinued because of the pain.

Two doses of neosalvarsan were given on January 7 and 14.

Blood Wassermann + + +.

Merc. serum.	Date.	Cerebrospinal fluid.			Wassermann.		Luetin.	Reaction.	Remarks.
		Pressure.	Cells.	Albumin	C. S. F.	Blood.			
I	Feb. 4	265	40	+	− − −	+ + +	+	.....	Contamination; hemoglobin.
II	Feb. 18	125	40	+	− − −	....	...	.....	Pupils sluggish; pains disappeared.
III	Apr. 17	125	3	+	− − −	....	...	Slight reaction	Fränkel movements continued.

Remarks: No pains since second treatment; restraint.

CASE V.—*Tabes dorsalis.*

W. M., aged thirty-six years; cabinet-maker.

Entered the hospital April 12, 1915, because of pains in the legs and loss of use of the legs.

Denies lues but admits two Neisserian infections fourteen years ago.

Eight months before admission had soreness and stiffness in legs on walking, so that soon he had little use of his legs. This was accompanied by great shooting pains in the legs and back. Bladder incontinence with dysuria developed.

Examination disclosed Argyll-Robertson pupils; absent knee-jerks and ankle-jerks; disturbed sensation in legs and nipple region.

Marked ataxia and positive Romberg.

Blood Wassermann negative; luetin +.

Cerebrospinal fluid: Wassermann negative.

Mercurial and three salvarsan treatments made no impression on the pains and bladder trouble. The result of treatment by mercurialized serum is shown in the table on page 272.

These cases illustrate in general the results which have been attained. In these 25 selected cases all have improved considerably even when other treatments were totally unavailing.

With improved technic the reaction following the first injection is very slight and consists usually of increase in the pain, slight dull headache, a temperature rising to 99° or 100° and perhaps slight nausea, all of which disappear in eighteen to thirty hours, and are easily controlled by opiates. Subsequent injections cause little or no reaction.

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		Pressure.	Cells.	Albumin	C. S. F.	Blood.		
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Merc. serum.	Date.	Cerebrospinal fluid.			Wassermann.		Luetin.	Reaction.	Remarks.
		Pressure increased	Cells.	Albumin	C. S. F.	Blood.			
I	May 17	?	100	+	– – –	– – –	+	Severe headaches, temp. 102°. Nausea	
II	June 3	?	12	?	– – –	....	...	Very slight headache and pain in legs. Temp. 98°	Bladder symptoms improved much.
III	June 16	?	17	–	Doubtful	....	...	Moderate reaction; pain in legs and hips. Headache. Girdle sensation.	Pain disappeared in twenty-four hours.
IV	Aug. 14	....	25	?	– – –	....	...	Very slight; 101°; slight headache	Great improvement in ataxia. No pain in legs.
V	Sept. 10	140	10	–	– – –	....	...	None	Bladder O. K.
VI	Sept. 24	....	8	–	.....	....	...	None	

Table showing result of treatment by mercurialized serum in Case V.

In the last 100 injections there has been practically no more reaction to the injection beyond that which would occur in any lavage of the subdural space.

Patients originally suffering from gastric crises usually had a severe crisis precipitated by the injections, although there were fewer and less severe crises following in one or two cases. These cases will be studied further. No sphincter disturbances were noted in any case. These are occasionally seen after the Swift-Ellis treatment.

It is important to examine the urine for abnormalities before each treatment, as the presence of albuminuria is, I believe, a distinct contra-indication for treatment.

In 85 Swift-Ellis treatments which I have done there has been no such marked improvement in clinical condition so early, as after the mercurialized serum is given. Occasionally a patient will have a severe outburst of pain, which is of very short duration, in the interval between treatments.

In the first case mentioned the bladder disturbance entirely cleared up after the second injection. The cellular contents of the spinal fluid rapidly diminished with the treatment in cases in which an abnormal count was found.

Conclusions. The facts of greatest interest to the neurologist in connection with the intraspinal mercurialized serum treatment are:

1. There is no danger in its administration.

2. For local treatment it is very efficacious in syphilis of the central nervous system, especially in the treatment of tabes dorsalis, in which lancinating pains are the predominant symptom.

3. Due to its stability the serum may be used at any time after its preparation.

4. The lack of expensive drugs used in its preparation makes it invaluable at this time.

5. There is no objection to a combined salvarsanized and mercuralized treatment.

6. It must not be concluded from the short space of time (eight months) that has elapsed since the beginning of this form of treatment in these cases that relief is going to be permanent. One will have to be cautious about prognosticating a cure until the proper length of time elapses, *e. g.*, at least three years. From the results obtained so far it certainly has mitigated the symptom of pain.

HEMATEMESIS DUE TO CHRONIC APPENDICITIS, WITH AN EXPLANATION OF ITS PATHOLOGICAL PHYSIOLOGY.

By John H. Outland, M.D.,
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AND
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The patient was a male, aged fifty years, by occupation a farmer. He was always well up to ten years before operation, although he has always been severely constipated. This began to be progressively worse at this period. He never had a definite attack of colic or acute abdominal illness.

Five years and a half before the operation he consulted a competent gastrologist, whose records we have been privileged to examine. The principal complaint was constipation and sour stomach, with eructations of acid material. Vomiting was not present to any extent. There was pain in the epigastrium before and after meals. He had never vomited blood except a few times after prolonged hiccoughing spells, which he often had. An examination of the stomach contents at this time discovered hyperacidity and hypersecretion. He was treated for a time, and was well after going home for about a year, when the same symptoms returned. He was treated by various methods with only temporary relief for about four years, when he presented himself for operation, advised by the gastrologist who had formerly examined him.

He had lost a few pounds in weight. The prominent symptom was still epigastric pain and recurrent vomiting. Two weeks before he had vomited twice, bringing up a pint of dark red blood each time. He was not jaundiced. There was considerable rigidity along the right rectus muscle and tenderness over the epigastrium, under the right ribs and in the right iliac fossa. He was given a test meal. He

returned for its removal a half-hour after the appointed time, but, nevertheless, the stomach tube brought away over a pint of highly acid material. The test for blood by Mayer's solution was positive. The diagnosis of pyloric ulcer and stenosis was made.

At operation an incision was made high up over the edge of the right rectus above the umbilicus. The gall-bladder was empty of stones, with thin walls, and easily emptied by pressure. The stomach had no sign of ulcer, no scar, no dimpling, and the pylorus was patent. The surface of the gastric serosa around the pylorus was reddened and mottled with small veins like a drunkard's cheek. The veins in the region were distended and tortuous, and in the mesentery along the greater curvature were numerous small, hard, shot-like glands.

On investigating the appendix it was found buried in a dense mass of adhesions, from which it was removed with great difficulty; in its mesentery were found several lymphatic glands the size of peas, one or two of which were removed for microscopic examination.

The ascending colon was enclosed in a veil of rather dense membranes, which extended across it from the abdominal parietes.

The appendix was removed and the abdomen closed. No attention was paid to the membrane on the ascending colon so far as operative measures were concerned.

One year after operation the patient's condition was good. He was free from the epigastric pain and hyperacidity, had never vomited since the operation, and his constipation was much better. He had gained ten pounds or more in weight.

Upon this history we desire to make several comments: Gastric hemorrhage in appendicitis has been described by Moynihan,[1] La Roque and several other authors, and since attention has been directed to it has been found by many surgeons of experience. No explanation of its cause has, however, so far as we are aware, been offered in print.

In the present case the first thing which should be emphasized is there is no possible doubt that a true inflammation of the appendix was present. The changes found were definite and evident to everyone who saw them. The evidence necessary to convince some surgeons that an appendix is diseased is often of the flimsiest nature: it may be too short, too long, too pale, or too red; the slightest kink may be pointed out as the cause of a hideous train of symptoms. In this case, however, the enlarged glands in the mesentery of the appendix, which were of enormous size, were objective evidences which could be seen, handled, and weighed, and are undeniably signs of chronic inflammation. Added to these is the heavy mass of adhesions around the appendix, the attachment of the mesentery, the constriction of the lumen, and the obliterating fibrosis seen in the sections.

[1] Brit. Med. Jour., January 29, 1910.

Next in importance are the changes observed in the serous covering of the stomach and the structure of the omentum and gastrocolic mesentery. The innumerable small glands in the omentum and mesentery, hard and universally distributed, pointed to a stream of infection carried up the omentum and deposited at the pylorus. The appearance of the stomach, mottled and covered with fine veins, was the evidence of the result of this bombardment of septic material.

The hemorrhage of the stomach was almost certainly due to the seepage from this inflamed gastric mucosa and serosa rather than any rupture of an enlarged vessel. The dyspepsia, the hyperacidity, and the epigastric pain were the reaction of the stomach to this continuous stream of irritation passing from the appendix up the omentum, which it will be remembered was attached directly to the appendix, to the organ which forms the attachment for the omentum —the stomach.

This, at least, is our own explanation. It explains not only this case but the many cases of dyspepsia exactly simulating the symptoms of gastric and duodenal ulcer in which no ulcer is found, but which in many cases when the appendix looks innocent enough are cured by an appendectomy.

May it not be possible that perhaps many cases of gastric or duodenal ulcer have their origin in a chronic appendix, that the ulcer may be the site of a septic embolus which has traveled along the omentum from a diseased appendix? We have no experimental evidence but abundant clinical reason to believe so.

Owing to the mistake in diagnosis in this case we were afforded an unusual opportunity of examining other organs besides the offending appendix. In most operations done for chronic appendicitis the incision is made low and no inspection of the stomach can be made: on the contrary, in many cases of gastric ulcer or cholecystitis no examination of the appendix is made. Moynihan in recent articles states that in all of his later operations for gastric or duodenal ulcer he examines the appendix and finds it diseased in the vast majority of cases.

Finally, this case is suggestive in another way: In looking over our past records we have noted two cases which were operated for gastric hemorrhage. The records state that no evidences of ulcer were found in either case. In both the stomach was opened and an inspection of the mucosa revealed a red, inflamed surface. Punctate points of hemorrhage were seized with forceps and ligated. No examination of the appendix was made in either case. It was designed at one time to group these cases and report them under the title "Idiopathic Gastric Hemorrhage." We now believe they were both due to chronic appendicitis.

REVIEWS

A Manual of Chemistry. A Guide to Lectures and Laboratory Work for Beginners in Chemistry. A Text-book Specially Adapted for Students of Medicine, Pharmacy and Dentistry. By W. Simon, Ph.D., M.D., late Professor of Chemistry in the College of Physicians and Surgeons, Baltimore, and in the Baltimore College of Dental Surgery; and Daniel Base, Ph.D., Professor of Chemistry in the Maryland College of Pharmacy, Department of the University of Maryland. Eleventh edition. Pp. 648; 55 illustrations. Philadelphia and New York: Lea & Febiger, 1916.

The approval of and the demand for the book is shown by the fact that it is now in its eleventh edition. Its object is "to furnish to the student in concise form a clear presentation of the science, an intelligent discussion of those substances which are of interest to him, and a trustworthy guide to his work in the laboratory." The work is comprehensive and fulfils the requirements of all those concerned with the medical aspects of chemistry. Changes in and additions to the new *United States Pharmacopœia* have been incorporated. In the section devoted to analytical chemistry a chapter on quantitative determinations by volumetric methods has been introduced. That part dealing with non-metals has been rearranged and much new material has been added. In Section I, on Physics, the chapters on light and electricity have been omitted because of their slight bearing on a course in elementary chemistry. This is particularly advantageous, in that it leaves the mind free to grasp the more important fundamentals having a distinct bearing on the work at hand. For a somewhat similar reason it might perhaps have been better to retain in full the section on Physiological Chemistry, since its importance justifies what may in some instances be a repetition of work already studied. Altogether, the change in the grouping of subject matter is a desirable one. Section I treats of chemical physics; Section II deals with the general chemistry of the non-metals and of the metals and their combinations; Section III is given over to analytical chemistry, while Section IV is devoted to the essentials of organic chemistry. The articles on the polariscope and spectroscope have been placed in the Appendix.

The view, as expressed on page 506, that inosite, $C_6H_6(OH)_6$, is a hexahydroxybenzene, is no longer tenable. In the light of our present knowledge, inosite is to be regarded as a hexahydroxy-hexamethylene, presumably formed from carbohydrates.

On the whole, this new edition is up-to-date and will continue to be accorded the approbation gained in the past. H. D.

A TEXT-BOOK OF PRACTICAL THERAPEUTICS. By HOBART AMORY HARE, B.Sc., M.D., Professor of Therapeutics, Materia Medica, and Diagnosis in the Jefferson Medical College; One Time Clinical Professor of Diseases of Children in the University of Pennsylvania. Sixteenth edition, revised and enlarged. Pp. 1009; 149 engravings and 17 plates. Philadelphia and New York: Lea & Febiger, 1916.

A BOOK which has stood before the medical public for twenty-six years, and which has now reached the sixteenth edition, is one which it hardly seems necessary even to attempt to review critically. The length of time that this book has been published is a very accurate index as to its original character, and the fact that it has reached its sixteenth edition shows that throughout the years of its life it has been constantly and accurately revised, and that whatsoever has appeared new in therapeutics has been placed in it. In this new edition Dr. Hare has continued the same splendid type of book that it has been heretofore. He has embodied in the text such changes in methods of treatment as have been described since the appearance of the last edition and such recent researches as have modified in part our conception of the physiological action of some drugs. There has also been incorporated in the present edition the official preparations of the *United States Pharmacopœia* and the *British Pharmacopœia*. The general method of arrangement and grouping of the drugs and of the methods of treatment other than drugs has been preserved.

The whole work is a splendid exhibition of therapeutics, as well as a demonstration of what one can do had he the knowledge, the experience, and the thoroughness that the author reveals in his text. J. H. M., JR.

THE PRACTITIONER'S VISITING LIST FOR 1917. Four styles: Weekly, Monthly, Perpetual, Sixty patient. Philadelphia and New York: Lea & Febiger.

THE *Practitioner's Visiting List* for this year has recently been issued. Those who have learned to depend on this little book

know its value. Those who have never used it have failed to avail themselves of a most convenient and practical aid to business efficiency in the practice of medicine. The *Practitioner's Visiting List*, issued in four styles, affords an easy and complete system for keeping the daily records of any practice, regardless of its size. In addition to the ruled pages for daily calls, this little book contains a text portion which embodies the sort of information so frequently needed by every physician; as, for example, a diagnostic table of eruptive fevers; a list of incompatibles; instructions for the examination of urine; and much other interesting data. To here attest its usefulness seems almost superfluous in view of the fact that for thirty years the *Practitioner's Visiting List* has been widely employed with satisfaction. G. M. P.

MEDICAL CLINICS OF CHICAGO, November, 1916. Philadelphia and London: W. B. Saunders Company, 1916.

THE November issue of the *Clinics* is initiated by the demonstration of Dr. Walter Hamburger, of The Modern Medical Treatment of Ulcer of the Stomach and Duodenum. This is a very interesting article, particularly well illustrated. The author shows by an apparatus which he has devised that the pain and sensations which arise in the course of gastric ulcer are not caused by hyperacid condition of the gastric contents, but are due entirely to the increased gastric muscle tonus, hyperperistalsis, gastric muscle spasm, and increased intragastric tension. He introduces a permanent tube in the stomach which is attached to an inflated balloon, which in turn is so fixed that the movement of this balloon may be registered on a smoked drum. In this way he is able to verify clinically the researches of Dr. Carlson. A minor point which does not seem fair to the originator is the calling of the Einhorn tube a Rehfuss tube. The latter made a very moderate change in the shape of the capsule, but in no way modified the tube otherwise, so the credit of the innovation should belong to Einhorn.

The next two clinics are upon a very trite subject, poliomyelitis, and are very well presented by Drs. Abt and Hamill.

Dr. Mix then shows two cases of primary pernicious anemia. Dr. Mix's opinion that this type of anemia is infectious in origin and that the infection producing organism is the spirochete of syphilis does not seem to be backed-up by very adequate arguments. In fact the arguments that he employs could be similarly used to prove that the etiology of the disease is based upon entirely dissimilar causes.

Dr. Pusey then presents a skin case, which is followed by Dr.

Tice with two cases, one showing Addison's syndrome and the other gangrene of the lung.

Dr. Kretschmer discusses the treatment of chronic colon pyelitis by pelvic lavage. Dr. Kretschmer says that the present consensus of opinion is in favor of the lymphatic route for these infections. It seems, however, that it is the opinion of a very large number of genito-urinary surgeons that the hematogenous route is the one most generally described as the important cause of infection to the renal pelvis.

Dr. Williamson in the next sections discusses a patient with polycystic kidneys; another one with recurrent endocarditis; and a third patient with an atypical case of gout. Dr. Williamson says that gout cannot be differentiated from rheumatism in many cases. As a matter of fact, if the blood uric acid and the blood urea or blood non-protein nitrogen be estimated at the same time acute rheumatism usually can be differentiated very readily from acute gout and chronic cases of gout can be separated from chronic arthritis.

Dr. Smithies concludes this number of the *Clinics* with a very interesting and careful exposition of cardiospasm associated with diffuse dilatation of the esophagus and the treatment by means of dilatation bougies. J. H. M., JR.

APPLIED IMMUNOLOGY. By B. A. THOMAS, A.M., M.D., Professor of Genito-urinary Surgery in the Polyclinic Hospital and College for Graduates in Medicine, and R. H. IVY, M.D., D.D.S., Assistant Instructor in Surgery, University of Pennsylvania. Second edition. Pp. 364; 68 illustrations. Philadelphia: J. B. Lippincott Company, 1916.

THE second edition of this useful book will find ready welcome by those who wish to have well-balanced information concerning the basis and practical application of our knowledge of immunity. The authors have revised the first edition without greatly adding to its bulk, a highly praiseworthy achievement, for there is a tendency to add fresh material without condensing. The subject is put in a pleasant, readable style. Many references are given in the text, but it would enhance the book if more were added so that readers might seek extensive, authoritative articles. The illustrations have the merit of illustrating.

Drs. Thomas and Ivy present the application of immunology with due attention to its limitations, and, while showing what good may be done, point out that no one of our procedures is incapable of failure. They emphasize the need of studying cases from the stand-point of their immunity and of knowing exactly what the infection is and is doing. In this respect it seems to the reviewer that somewhat more space might be devoted to the protection of

persons getting foreign serums, such as dividing the dose, never giving a single dose of serum, but following the first by another, may be smaller one, to throw the patient into an anti-anaphylactic state, and the use of atropin. These things can all be done, and should be done, in persons who show allergie to plant protein, as pollensis, or to vegetable protein, as berry rashes, or to animal protein, as shell-fish.

While the authors justly denounce the use of phylacogens indiscriminately, this is a closely related subject of leukocytosis and bacterinization by non-specific proteins which is being used in certain forms of arthritis and to which some attention is due if only to point out the limitations. The attention of the authors should be called to the word "exoteric" on page 221, the meaning of which would be esoteric there. The error is in both editions; doubtless exotoxic is intended. H. F.

THE SEX COMPLEX. A STUDY OF THE RELATIONSHIP OF THE INTERNAL SECRETIONS TO THE FEMALE CHARACTERISTICS AND FUNCTIONS IN HEALTH AND DISEASE. By W. BLAIR BELL, B.S., M.D., London, Examiner in Gynecology and Obstetrics to the University of Belfast, and to the Royal College of Surgeons, England. Pp. 233; 50 illustrations. New York: William Wood & Co., 1916.

"PROPTER secretiones internas totas mulier est quod est."

Because of his belief and the importance of the subject to physiology and gynecology, the author has amplified and rewritten in book form, in the hope of stimulating interest and adducing new facts, his investigations and communications as first announced in the Arris and Gale Lectures in 1913, in which he first attempted to demonstrate that the reproductive functions are governed by all the organs of internal secretion acting conjointly, rather than by the gonads alone, as formerly thought.

The subject matter is divided into two parts. Part I deals with the morphological, physiological, and psychological considerations. Due consideration is given to the primary and secondary sex characteristics. He discusses the functions of the ovaries and the effects of oöphorectomy on the genitalia, general metabolism and the several ductless glands, also the relation of the thyroid, parathyroids, pineal, pituitary, thymus, suprarenals, pancreas, and mammary glands to the genital system, as deduced from extensive animal experimentation concerned with the removal of these endocritic organs. In other words the disquisition resolves itself into (1) a consideration of the factors which lead to the production and maintenance of the normal characteristics and functions of woman, so far as her feminine

attributes, primary and secondary, both of mind and body are concerned, and (2) a discussion of the morphological and physiological derangements of the sex complex. With the assumption "that femininity itself is dependent on all the internal secretions," the author by his experimental and histological studies, supported by fifty illustrations, almost all of which are photomicrographs of experimental ductless glands, concludes that the ovaries must be considered as part of a system, to which most, if not all, the other endocritic glands belong, and in which they, in their relation to reproduction, are as much concerned as the ovaries themselves, which by their hormones particularly, are able to bend the metabolism of the body to this purpose. Indeed, Bell would have us believe that the thyroid, pituitary, and suprarenals influence the development and subsequently preserve the integrity and activity of the genitalia, while the thymus and pineal prevent sexual precocity.

Part II is given over to pathological considerations, especially derangements in the structural and functional development of the genital organs and their functions, derangements of the fully established female characteristics and functions and sexual and reproductive psychosis and neuroses.

The classification of hermaphroditism and its consideration, together with puberty, is the most scientific, complete and best we have seen. All in all, this work of Bell is highly commendable and the book, most creditable from the publisher's stand-point, is a valuable addition to modern medicine, commanding the serious attention of all practitioners interested in gynecology and andrology.

B. A. T.

THE CRIMINAL IMBECILE. AN ANALYSIS OF THREE REMARKABLE MURDER CASES. By HENRY HERBERT GODDARD, M.D. Pp. 154. New York: The Macmillan Company.

THIS is a very interesting book on the criminal imbecile. It is an analysis of three rather well-known homicide cases in each of which the defendants were tried for murder. In the Gianini case the Binet-Simon tests were used perhaps for the first time in the history of legal medicine in this country. More remarkable still the jury acquitted the defendant on the ground of criminal imbecility. In the Roland Pennington case the jury found the man guilty and he was only recently electrocuted. This case was especially interesting to Philadelphians, inasmuch as the crime was committee only a few miles from this centre. In both of these cases the author acted as an expert. The third case is equally interesting but the author did not have the opportunity to study him.

The whole point of discussion is that in all of these cases the defendants were high-grade imbeciles and emphasis is laid on

the fact that in so many similar instances this is the case. This problem will never be solved as long as this type of individual is allowed at large. In the experience of the reviewer as well as the experience of all alienists it is common to run across such individuals and the problem is what to do with them. Not long ago with other physicians the reviewer examined many individuals in the Philadelphia House of Correction in which many such imbeciles were found. Yet there is no law which allows the city to hold these individuals and to treat them. As a consequence the reviewer made an inquiry as to whether there were laws which gave courts the right to examine these individuals for the purpose of placing them in institutions which could control them. In only one instance did he find that there was such a law. Nothing can ever be accomplished until the National Government takes up this matter and makes it possible that throughout the whole United States similar measures should be adopted. So long as each city or State is allowed to make its own laws or rather do without any law, just so long the question of the criminal imbecile will be a standing menace to the community.

T. H. W.

AN INTRODUCTION TO THE STUDY OF COLOR VISION. By J. HERBERT PARSONS, D.Sc., F.R.C.S. Cambridge University Press, New York: G. P. Putnam's Sons.

WITH this study of color vision the author has given us another volume that maintains the high standards attained by his previous works. The vast literature on this subject has been reviewed, sifted, and woven together in a work that presents the important facts concerning the subject in a manner that will make this volume of real use to those interested in this subject. There are but few men, confining their energies to ophthalmology, who are as well qualified as the author to write a volume of this character, for aside from his qualification as a practitioner and pathologist he has shown much interest in vision in its various phases and has made a number of valuable contributions to this subject.

The work is divided into three parts: The first discusses the chief facts of normal color vision; the second, the chief facts of color blindness; the third, the chief theories of color vision. The first two parts are of greater interest to the physiologist and psychologist, but they contain much that the practical ophthalmologist could absorb with profit, but it will require careful and thoughtful reading, owing to the mathematical and experimental character of the work. Part three deals with the more practical side of the subject, and in it are discussed the Young-Helmholtz and Hering

theories as well as the theories of Donders, Ladd-Franklin, McDougall, Schenck, Wundt, Müller, and Edridge-Green.

In the reviewer's experience there is probably no branch of ophthalmology concerning which the average practitioner has such a limited knowledge. In this volume this intricate subject is handled in the masterly way one would expect when we consider both the scientific and practical training of the author. T. B. H.

REFRACTION OF THE HUMAN EYE AND METHODS OF ESTIMATING THE REFRACTION. By JAMES THORINGTON, A.M., M.D. Pp. 407; 347 illustrations, 27 in colors. Philadelphia: P. Blakiston's Son & Co.

IN order to simplify the work of the student, the author has very wisely condensed his volumes on *Refraction and How to Refract*, *Prisms*, and *Retinoscopy* into one volume. In so doing he has produced his best work, and one that is certain to meet with popular approval. The volume is divided into twenty-three chapters, so arranged that beginning with optics the student is judiciously and easily lead through the various phases of the subject until the more practical part, dealing with refraction, is discussed, and finally the measuring and fitting of glasses. The generosity with which the volume is illustrated also adds much to the convenience of the reader.

The author is not only to be congratulated on the appearance of his most satisfactory work, but also in his decision to eliminate certain obsolete test from a practical manual of this type.

T. B. H.

DISEASES OF THE SKIN. By RICHARD L. SUTTON, M.D., Professor of Diseases of the Skin, University of Kansas School of Medicine; Dermatologist to the Christian Church Hospital. Pp. 916; 693 illustrations and 18 colored plates. St. Louis: C. V. Mosby Company, 1916.

SUTTON'S text-book on skin diseases is a variant from the modern large treatises published in this country on cutaneous affections: (1) it contains from 100 to 400 pages less; (2) fully twice as many illustrations are employed as in any other book, exclusive of an atlas; (3) more stress has been laid upon the pathology, and there are more illustrations depicting the histopathology of this subject than in all of the other American cutaneous treatises combined.

Naturally with the lessened text and the doubled space occupied by the illustrations the detailed description is not so complete as in

the other large treatises. A considerable amount of repetition has been avoided, which naturally saves quite a few pages.

Sutton uses the classification as originally adopted by Hebra and modified by Crocker, and therefore sticks to the conservative rather than attempting a more modern but possibly too extreme adaptation of the etiological factors. The preliminary chapters on general etiology, pathology, and diagnosis are concise, and contain the modern views upon the subject. The massive dose method of roentgen therapy and radium treatment are ably described in addition to all of the other therapeutic measures. The volume contains all of the newer diseases, such as cutaneous thrush, foot-and-mouth disease, trichinosis, etc.

The writer is particularly fortunate in being located in the West, and therefore having had unusual opportunities in observing and treating blastomycosis and sporotrichosis. Friends of the author have supplied excellent photographs of cutaneous outbreaks in the American Indian, the negro from our Island possessions, and elsewhere. The peruser, therefore, has the opportunity of studying practical illustrations of frambesia, espudia, gangosa, erythrasma, Norwegian scabies, tinea imbricata, etc. Several color plates illustrate beautifully foot-and-mouth disease, angiokeratoma, the histopathology of nevus linearis, hemorrhagic sarcoma of Kaposi, lupus erythematosus, and ulcerating granuloma of the pudenda.

The section on carcinoma is particularly good, and divides the subject into the squamous-cell and the basal-cell, depending upon the portion of the skin from which the growth takes its origin. Treatment for this prevalent disease is fully described. Syphilis is given in detail, and the section on the therapeutic measures is lucidly and valuably written. The various exanthemata are exploited under the heading of Inflammations. The illustrations depicting the mucous membrane and nail diseases are unusually clear and therefore of enhanced value.

Sufficient references are cited to give those who care for extensive research a survey of the more valuable literature.

If criticism were to be offered, the suggestion might be made that too many photographs are employed under certain diseases depicting the same characteristics; that some of the illustrations of different cutaneous outbreaks are absolutely indistinguishable the one from the other, such as those picturing psoriasis of the palm, seborrhoic eczema and squamous eczema of the same location. A score or more of the photographs should be discarded because of lack of distinctness of detail; this fault it is only fair to state is probably due to the publisher rather than the author.

The volume is attractive in every detail, well-printed, and the paper is sufficiently highly glazed to give a clearness and practical detail to most of the illustrations. The author is to be congratulated upon the excellence of his work and the valuable addition he has made to American dermatology. F. C. K.

WHO IS INSANE? By STEPHEN SMITH, M.D. Pp. 285. New York: The Macmillan Company, 1916.

THIS is an extremely entertaining book. The author in 1882 was appointed State Commissioner in Lunacy, occupying this position for about six years. On assuming office Governor Cornell informed him that there was a popular belief that many asylum inmates were not insane and advised him to keep constantly in mind in visiting the asylum the question, "Who is Insane?" The author apparently accomplished a great deal, for during his service he effected: (1) the introduction of the Training School for Attendants; (2) the creation of a State Commission in Lunacy; (3) the removal of the insane from County to State care. No State in the union takes better care of its insane than New York. Some of the other States, notably Massachusetts, has followed in its footsteps. The reviewer with other neurologists has tried to get the Pennsylvania legislature to adopt the methods of New York and it is the hope of Pennsylvania physicians that such methods will some day be adopted. This is only mentioned to show what the author of this work has apparently helped to accomplish.

The book is meant for the layman. He first discusses "who is insane" and "what is insanity" and gives some very interesting and dramatic stories to illustrate his points. Later on he discusses the critical periods of life predisposing to insanity, care and treatment of the insane, the lessons applied to the feeble-minded and criminal, and lastly he indulges in the hope that some day better things can be accomplished. For the layman it is an excellent introduction into insanity and what it means, for the author has had the good judgment to not only make his work instructive, but sufficiently interesting so that anyone will be bound to finish the book.

T. H. W.

SURGICAL AND GYNECOLOGICAL NURSING. By EDWARD MASON PARKER, Surgeon to Providence Hospital, and SCOTT DUDLEY BRECKENRIDGE, Gynecologist to Providence Hospital, Washington, D. C. Pp. 402; 134 illustrations. Philadelphia and London: J. B. Lippincott Company, 1916.

THIS work takes up in a very thorough manner, from both a theoretical and practical stand-point, the essentials of nursing as applied to surgical and gynecological work. Opening with a brief consideration of the cell as the body unit, it goes on to explain the nature and modes of infection, with a *résumé* of the most important points of surgical pathology. The remainder of the book is eminently practical. The succeeding chapters explain in considerable detail the various measures of what may be termed "minor nursing,"

such as postures, bandaging, the giving of enemas, hypodermics, enteroclysis, etc., with useful sections on methods of obtaining fractional doses from hypodermic tablets of standard strength and comparative tables of the metric and English systems. The actual work of the operating room is then discussed, with very practical lists and group illustrations of the instruments needed for all the ordinary major operations. The routine nursing of operative cases is admirably discussed, with a brief chapter on the most important postoperative complications for which the nurse should be on the watch. The work, as a whole, is refreshingly sane and practical; it has obviously been written by men who are in daily contact with the problems presented, and there is no evidence of "padding," in the way of unnecessary refinements or complications which look well on paper, but are always discarded in actual work. Thus, when the fullest aseptic precautions are not required in certain procedures, this fact is frankly stated. The general excellence of the work, as a whole, is so marked, however, that one rather glaring omission cannot be passed over in silence. In view of the almost universal employment today of dry sterilized gloves in the operating room, it seems strange that no good method of their preparation is described, the statement that "when the dry method is used, the gloves *after coming from the sterilizer* must be thoroughly dried between sterile towels, and then turned inside out and dried again; all this must be done by a 'clean' nurse wearing sterile gloves," being quoted only to be heartily condemned. The book, as a whole, is perhaps a trifle lengthy, but can be thoroughly recommended to those who want an excellent manual of all phases of surgical and operating-room nursing. G. W. O.

PHYSICS AND CHEMISTRY FOR NURSES. By AMY ELIZABETH POPE, Instructor in the School of Nursing, St. Luke's Hospital, San Francisco, Cal. Pp. 426; 74 illustrations. New York and London: G. P. Putnam's Sons, 1916.

THE book has for its purpose the presentation of such physical and chemical knowledge as every nurse should possess. It explains important chemical and physical processes and their relation to disinfection, cleaning, cooking, digestion, water supply, textiles, food adulteration, and metabolism. The subject matter is presented in a clear, simple, and concise manner, which makes it easily read. A great many experiments are described, "any or all of which," as the author states, "can be omitted without interfering with the value of the lessons." However, it is distinctly advantageous to include as many experiments as possible, since actual work in the laboratory is of such great value in acquiring a better understanding of the subject studied. H. D.

PROGRESS
OF
MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

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The Lipoids ("Fat") of the Blood in Diabetes.—W. R. BLOOR (*Jour. Biol. Chem.*, 1916, xxvi, 417), with the coöperation of E. P. JOSLIN and A. A. HORNOR, has examined the blood lipoids in a series of cases of diabetes mellitus. The work is summarized as follows: In severe diabetes the blood lipoids were all markedly increased up to 100 per cent. or more of the normal values. In mild diabetes the lipoids may be normal. In general, the more severe or long standing the diabetic condition the more marked was the abnormality in the blood lipoids. In spite of the high values, the relations between the lipoids were practically those of normal individuals, indicating that the fat metabolism was essentially normal. There was a tendency, however, for the fat to accumulate in excess of the other constituents, and this fact and possibly also the high lipoid values foreshadow the lipemia. The high lipoid values noted occurred entirely in the plasma, the composition of the corpuscles remaining practically normal. The fact that cholesterol increased parallel with the fat in diabetic blood, even in severe lipemia, gives further support to the earlier assumption that cholesterol has a part, and probably an important part, in fat metabolism. For the same reason the determination of cholesterol in the plasma (a relatively simple process) should give valuable information regarding the lipoid content of the blood in diabetes. In the present series no definite relation could be found between high blood lipoids and the occurrence of acetone bodies in the urine. *Lipemia:* Lipemia was observed in but 2 of the 36 cases in this series and these were not

under treatment but were on an unrestricted diet. No lipemia was found in any of the cases under treatment. Evidence is presented to indicate that diabetic lipemia originates mainly in the fat of the food, and that the probable reason for its appearance in the blood is a partial failure of the mechanism for dealing with fat. Cholesterol increased parallel with the fat up to eight times its normal value, while lecithin is relatively little increased. Since lecithin formation has been found to be an early stage in the metabolism of fat, it is possible that the inability to form lecithin may be a factor in the production of the lipemia.

The Production of Amyloid Disease and Chronic Nephritis in Rabbits by Repeated Intravenous Injections of Living Colon Bacilli.—C. H. BAILEY (*Jour. Exper. Med.*, 1916, xxiii, 773) finds that the repeated intravenous injection of rabbits with living Bacillus coli communis over long periods has resulted in the formation of amyloid deposits in the spleen, liver, and kidneys. Suppurative lesions were not present in most cases, and therefore not a factor in its production. The results have been constant in that amyloid was found in all rabbits, 8 in number, which were injected over a period of eighty-eight days or more. Eight rabbits showed amyloid in the spleen, 6 of these in the kidneys also, and 3 in the liver. The kidneys of these 8 rabbits also showed as a result of the injection a subacute and chronic glomerulitis, parenchymatous degeneration, some interstitial infiltration with round cells, and a slight cellular proliferation of connective tissue, thus resembling the chronic parenchymatous nephritis of man, which is so commonly associated with amyloid disease.

Chemical Versus Serum Treatment of Epidemic Meningitis.—S. FLEXNER and H. L. AMOSS (*Jour. Exper. Med.*, 1916, xxiii, 683) have made an experimental investigation of the protargol treatment of epidemic meningitis recently proposed by Wolff, who had 5 recoveries out of 8 cases. While Wolff admits that the number of cases is too small to justify claims for a cure, yet he believes that the protargol treatment is at least harmless. The authors find that protargol is without beneficial influence upon experimental infections in young guinea-pigs and monkeys. On the contrary, they find that protargol exerts antileukotactic and antiphagocytic effects, and is also a potent protoplasmic poison. The leukocytes with which it comes in contact are injured and made to degenerate. According to the extent to which these harmful properties are excited, protargol promotes the advance rather than the restraint of the progress of meningococcic infection. Results analogous to those with protargol were obtained with lysol. The authors conclude that specific antiserum should be employed in the treatment of epidemic meningitis.

The Non-coagulable Nitrogen of the Blood in Intestinal Obstruction.—J. V. COOKE, F. H. RODENBAUGH and G. H. WHIPPLE (*Jour. Exper. Med.*, 1916, xxiii, 717) report a study of intestinal obstruction, largely experimental, which they summarize as follows: Intestinal obstruction, as a rule, is associated with an increasing amount of non-coagulable nitrogen in the blood. With acute intoxication the rise in non-coagu-

lable nitrogen may be rapid, and reach as high as three or even ten times normal. With more chronic intoxication there may be little or no rise in the blood non-coagulable nitrogen. Closed intestinal loops show exactly the same picture, and when combined with obstruction may give very high nitrogen readings. Acute proteose intoxication due to injection of a pure proteose will show a prompt rise in blood non-coagulable nitrogen, even an increase of 100 per cent. within three or four hours. These intoxications also show a high blood content of creatinin and urea. The residual or undetermined nitrogen may be very high. A human case of intestinal obstruction with autopsy presents blood findings exactly similar to those observed in many animal experiments. Clinically, the non-coagulable nitrogen of the blood may give information of value in intestinal obstruction. A high reading means a grave intoxication, but a low reading may be observed in some fatal cases, and gives no assurance that a fatal intoxication may not supervene. The kidneys in practically all these experiments are normal in all respects. It is possible that protein or tissue destruction rather than impaired eliminative function is responsible for the rise in non-coagulable nitrogen of the blood in these acute intoxications. Transfusions of dextrose solutions often benefit intestinal obstructions and may depress the level of the non-coagulable nitrogen in the blood. Some cases show no change in non-coagulable nitrogen following transfusions and diuresis, and, as a rule, such cases present the most severe intoxication.

The Development of Malaria Parasites in Three American Species of Anopheles.—W. V. KING (*Jour. Exper. Med.*, 1916, xxiii, 703) reports a study of the susceptibility to malarial infection of the three most prevalent species of anopheles in this country. He has found that Anopheles punctipennis is an efficient host of the organisms of tertian and estivo-autumnal malaria and Anopheles crucians may likewise transmit the estivo-autumnal parasites. Anopheles quadrimaculatus has been known to be an efficient host since Thayer's experiments in 1900. With Anopheles punctipennis, developmental forms of the sporogenic cycle of Plasmodium vivax were demonstrated in 6 of 7 mosquitoes dissected and of Plasmodium falciparum in 4 of 20 specimens. With Anopheles crucians, oöcysts or sporozoites, or both, of Plasmodium falciparum were found in 9 of 12 specimens dissected. No tests were made with this species and Plasmodium vivax. Anopheles quadrimaculatus was employed as a control species in the experiment and became infected, as in the following ratio: 8 of 12 specimens with Plasmodium vivax and 3 of 19 specimens with Plasmodium falciparum. The number of observations is comparatively small, but it would seem that Anopheles punctipennis and Anopheles quadrimaculatus are equally susceptible to infection with Plasmodium vivax. With Plasmodium falciparum, Anopheles crucians showed the highest percentage of infection, with Anopheles punctipennus second, and Anopheles punctipennis third.

SURGERY

UNDER THE CHARGE OF

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Transplantation of Fascia for Pointed-toe Deformity.—ORTH (*Zentralbl. f. Chir.*, 1916, xliii, 812) says that pointed-toe deformity has increased of late in military and non-military service. In many cases gymnastic and other corrective exercises were unsuccessful, and only operation gave hope of making the patients useful. So long as tbe tendons are not too much contracted or degenerated by cicatricial tissue, the methods of Beyer and Vulpius are sufficient. But when these conditions do exist or the original lesion affects the tendon itself, we may lengthen the tendon by the transplantation of a suitable piece of fascia to fill the gap resulting from the division of the tendon. The transplanted piece of fascia did not become necrotic or contract. Passive movements were begun after fourteen days and active movements after three to four weeks. The results were good in three soldiers so operated on. Two of them returned to service in the field and one to garrison duty.

Proving the Collateral Circulation in a Case of Femoral Aneurysm by the Henle-Coenen Sign.—DREYER (*Zentralbl. f. Chir.*, 1916, xliii, 825) proceeded as follows in a case of aneurysm in Hunter's canal: He exposed the femoral vessels central to the aneurysm in an easily accessible place and clamped the artery here. He then isolated the vessels in the popliteal space, and divided a lateral branch of the popliteal artery. The free bleeding from the central end of the divided branch proved a sufficient collateral circulation to justify the application of a simple ligature to the femoral artery on the central side and another to the popliteal artery on the peripheral side of the aneurysm. There was not the slightest disturbance in nutrition. The patient got out of bed on the eighth day and walked around. The author offers the following modification of the proof of the condition of the collateral circulation: The application of a preliminary clamp on the peripheral as well as on the central side of the aneurysm.

The Electromagnet in War Surgery.—CORDS (*Zentralbl. f. Chir.*, 1916, xliii, 865) refers to Capelle's article on the treatment of erysipelas with artificial sunlight and relates his own experience with the method. He begins with daily ten-minute exposures and obtains favorable results. Recently he began to use exposures to the rays of the sun. According to his small experience, the exposure to the free air and sun is to be preferred to the exposure to artificial sunlight. One patient with recurring erysipelas and a perforating, sequestrating, gunshot

wound of the thigh, had become exhausted from several attacks of erysipelas and long-continued fever. In the midst of the fever, he was left continuously on a veranda, with the naked limb exposed to the air and sun. In two days the temperature had fallen to normal and the erysipelas had disappeared. He recovered rapidly but after a longer interval than usual had a recurrence of the erysipelas. This attack, however, was of much shorter duration than the preceding ones, which were much more severe.

The Effect of the Pointed Bullet on the Shaft and Ends of the Bone.—MACKOWSKI (*Deutsch. Ztschr. f. Chir.*, 1916, cxxxvii, 403) says that extensive splintering was found most frequently in the shaft and usually in what is termed the butterfly figure. This resulted when the bullet struck about midway in the width and length of the bone. When it struck the shaft in the middle of its width and near the epiphyseal end, the fragments lying toward the middle of the shaft were longer than toward the epiphyseal end, which often broke off transversely. When the bullet so hit the shaft as to divide it into two unequal parts, the larger fragment broke into large fragments and the smaller into smaller fragments. The stronger and thicker the shaft, the larger were the fragments. In fractures of the shaft of the femur the fragments were larger than in fractures of the shafts of the smaller bones, as the forearm and leg. Fractures of the shaft without division of continuity occurred almost always in the slender forearm and leg bones. They were not observed in the humerus or femur. The most frequent fracture of the femoral shaft is the large splintered oblique fracture with long pointed fracture ends. Transverse fractures were seen almost only in the shaft of the humerus. The humeral head was usually bored through without splintering, although in some cases small splinters occurred.

Gunshot Wounds of Peripheral Nerves.—STOOKLY (*Surg., Gynec. and Obst.*, 1916, xxiii, 639) based his paper on a study of 75 cases of nerve injuries, observed in the present war in the British Military Service. He says that peripheral nerves may be injured by projectiles, pieces of bone or foreign bodies, and may be implicated secondarily by scar tissue, or callus, or both. Diagnosis cannot be made before operation between anatomical and physiological division. Diagnosis can usually be made in cases with incomplete division. In war surgery primary suture is rarely possible due to infection. Operation is indicated when complete division is diagnosed. Nerve freeing is in many cases to be preferred to excision and suture. When the nerve is widely implicated and there is a large loss of continuity, it is better to do nerve transference or nerve transplantation than tubulization or suture with the nerve under tension. Stretching of the nerve should not be done as it causes karyolysis of the nerve cells in the anterior horn with subsequent degeneration of the nerve axon in the proximal nerve trunk. Efficient splinting to prevent contractures and overstretching of the muscles is imperative, both before and after operation. The musculospiral nerve injured in its lower third does show loss of sensation on a narrow band over dorsum of thumb, usually only loss to cotton-wool and temperature sense. Injury to the musculospiral

may cause dissociation of temperature sense in the area on the dorsum of the hand—without loss to cotton-wool. Return of motor function begins with the muscles which first receive their supply below the lesion. The return is earlier the nearer the lesion to the periphery. Trophic ulcers occur only after trauma. Their repair appears to be no different than in other parts.

A Study of Exstrophy of the Bladder.—STEVENS (*Surg., Gynec. and Obst.*, 1916, xxiii, 702) presents a study of the literature and reports a case five years after implantation of the ureters into the rectum. He reported the patient at work, in perfect health, and changed from a wretched, dejected, lonely boy to a bright and happy lad with a real interest in life. Stevens emphasizes the wisdom of a careful preliminary examination of the kidneys before any operation is undertaken on a case of exstrophy of the bladder. The operation is clearly indicated if there be no severe renal infection. Methods which effect no control of the urine offer but little comfort to the patient. The simpler procedures that do provide a sphincter are to be preferred. The newer methods which form an extra-intestinal, perineal channel, lined with epithelium and controlled by the sphincter ani, have not been sufficiently tested clinically. The author believes that uretero-intestinal anastomoses offer the exstrophy patients the best outlook at the present time. The subject is intimately associated with bladder exclusion for other ailments, and the problem of control of ascending infection is deserving of all the experimental and clinical work being done. Bergenheim's operation is the best for this condition. It consists essentially of the independent extraperitoneal implantation of the ureters, each with a rosette of bladder-wall, into the rectum, with removal of the bladder. Preservation of the ureteral sphincter is worth while, whether it acts as a valve or sphincter or whether its preservation merely offers a more circuitous and less likely route for ascending infection to follow in order to reach the ureteral lymphatics.

Direct Neurotization of Paralyzed Muscles.—STEINDLER (*Am. Jour. Orthop. Surg.*, 1916, xiv, 707) studied experimentally on dogs the Heineke idea of the possibility of implanting peripheral nerves directy into paralyzed muscles. Heineke maintained that motor impulses can in this way be directly transmitted to the muscle. A further step was taken by Erlacher in maintaining the possibility of neutralizing the paralyzed muscles by means of direct contact between normal and paralyzed muscle, and without the implantation of the peripheral nerve. The author found that direct neurotization, in the sense of Heineke and Erlacher, is indeed possible. The natural limits of physiological regeneration allows motor nerve, directly implanted into paralyzed muscle tissue, to establish by regeneration the entire chain of neurometer connections. From the experiments it appears that this regeneration becomes complete in from eight to ten weeks after the implantation. In close succession to the regeneration of nerve tissue the muscle tissue also regenerates, and this becomes manifest in the reappearance of the normal contours of the fibers and the normal striations. Physiological test of the reneurotized muscles also show that regeneration of the muscle takes place centrifugally from the

point of implantation. In none of the experiments was there observed in a normal muscle any inclination to take on additional nerve supply, though ample occasion was furnished for this effect. For this reason Steindler is inclined to be rather skeptical about the question of hyperneurotization. Apparently totally paralyzed muscles in infantile paralysis were regularly found to contain a variable number of perfectly normal muscle fibers and a considerable amount of nervous elements. A definite statement concerning the clinical application of these facts to cases of infantile and other paralysis should be withheld until one or two more points are more clearly understood.

THERAPEUTICS

UNDER THE CHARGE OF

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The Treatment of Syphilis of the Central Nervous System.—WALKER and HALLER (*Arch. Int. Med.*, 1916, xviii, 376) report 75 patients with central nervous system syphilis treated with 450 intraspinal injections of salvarsanized serum and with 350 intravenous injections of salvarsan. At first only salvarsan intravenously was used, and a few patients improved rapidly. However, in many cases little or no improvement followed from three to six injections, so these patients were then given intraspinal salvarsanized serum in conjunction with the salvarsan, and they improved rapidly under the combined treatment (Swift-Ellis method). As the intraspinal treatment seemed to reinforce the salvarsan the authors desired to determine what results would follow the intraspinal method alone. For this method they selected patients with a negative Wassermann reaction in the serum and with positive findings in the spinal fluid. The results from this method closely paralleled those from the double method. Therefore, the following rule has been adopted at the Peter Bent Brigham Hospital: Patients are first treated with intravenous salvarsan. If satisfactory results do not follow three or four such treatments, they are then given intraspinal salvarsanized serum in conjunction with intravenous salvarsan. Those who have a negative reaction in the serum are given only intraspinal salvarsanized serum. To thirteen patients were given five or more intravenous injections of salvarsan alone. Four of these patients, three with cerebrospinal syphilis and one with syphilitic meningitis, had very recent infections and were relieved of their symptoms. The spinal fluid cell count was reduced to normal in three cases, and the Wassermann reaction became negative with 1 c.c. in three cases. The remaining nine patients had older infections and they showed little or no improvement in their symptoms and no improve-

ment in the spinal fluid findings. To thirty patients were given three or more double (Swift-Ellis) treatments, and marked improvement followed in each case. Thirteen patients who were previously incapacitated were restored to working capacity; of eighteen with ataxia, eight were relieved, five were markedly improved and five more were much improved. Seventy-five patients showed improvement in the spinal fluid Wassermann reaction; in ten cases this amounted to from 0.3 c.c. to 0.5 c.c., and in five other cases the reaction became negative with 1 c.c. The spinal fluid cell count became five or less in twenty-five cases. In four cases a period of two years has elapsed since treatment without any return of symptoms, in three others a period of eighteen months and in eight others six months or more. Four patients have shown some form of relapse. One with tabes had a relapse in ataxia, two with general paresis of the insane had a temporary relapse in mentality, while one with cerebrospinal syphilis developed a weakness in the legs probably of cerebral origin. Seventeen patients were treated intraspinally with salvarsanized serum alone, and all were markedly improved or relieved symptomatically. Nine who were previously unable to work were restored to working capacity. Of the seven patients with ataxia, four previously unable to work at all, became able to work, and in the other three, in whom the ataxia was not so marked there was great improvement. The Wassermann reaction in the spinal fluid became negative with 1 c.c. or 2 c.c. in eight cases, and in five others it was improved from 0.3 c.c. to 0.5 c.c. The spinal fluid cell count became normal in nearly every case. Two patients with syphilitic meningitis were relieved in every way. Seven patients have been observed twelve months since treatment was stopped, and four others for six months or more, and they show no return of symptoms. One patient with cerebrospinal syphilis had a return of headache after eight months, and two with tabes had a slight relapse in ataxia, which rapidly cleared up immediately following a treatment. In one patient a provocative Wassermann reaction occurred in the spinal fluid following the administration of salvarsan and in two cases a provocative reaction occurred in the spinal fluid following intraspinal treatment. Two patients with repeatedly negative reactions in the serum while under intraspinal treatment developed a positive reaction in the serum about the time the spinal fluid reaction became negative with 1 c.c. Improvement in symptoms following treatment seemed to parallel fairly closely the drop in the cell count, and those patients with high cell count seemed to improve symptomatically more rapidly and the cell count dropped more rapidly than occurred in those cases with low cell count. The only physical sign which was changed in these cases was that a positive Romberg in one case became negative. More benefit seemed to follow moderate after-treatment reactions than when no reaction occurred. Severe reactions are undesirable and may be avoided by less frequent treatments. In this series of cases no fatal or disturbing results followed treatment. In this series of cases the total number of cells in the spinal fluid did not vary as a rule. In a few cases of tabes, during severe crises of pain, and in cases immediately following too frequent and too large intraspinal injections of salvarsanized serum, the cell count temporarily increased. In their conclusions the authors state that patients with recent syphilitic meningitis and cerebrospinal

syphilis may be relieved symptomatically by intravenous salvarsan; the spinal fluid Wassermann reaction may become negative with 1 c.c. and the cell count may become normal. Patients with long-standing cerebrospinal syphilis and tabes may be benefited symptomatically following salvarsan intravenously, but little or no change occurs in the spinal fluid findings. Patients with recent and those with late syphilitic meningitis, cerebrospinal syphilis, tabes and general paresis of the insane are markedly improved following the combination of intravenous salvarsan and intraspinal salvarsanized serum (Swift-Ellis method), and those who fail to improve under salvarsan alone do improve both in symptoms and in spinal fluid findings following this double treatment. That intraspinal salvarsanized serum greatly benefits patients with central nervous system syphilis is shown by the fact that those with negative serum reactions and with positive spinal fluid findings are symptomatically relieved by this treatment. In many patients the spinal fluid Wassermann reaction becomes negative with 1 c.c., the cell count becomes normal and a negative (Noguchi) globulin test is obtained following sufficient treatment with salvarsanized serum intraspinally without other medication.

Antidotes in Mercuric Chloride Poisoning.—FAUTUS (*Jour. Lab. and Clin. Med.*, 1916, i, 879) from an experimental study concludes that egg albumen is of little value as an antidote to mercuric chloride, unless it is given immediately after the poison is swallowed. Milk and serum albumen are worthless. Hall's solution (potassium iodide and quinin) is useless as an antidote. Sodium bicarbonate and sodium acetate possibly have a moderate antidotal value. Sodium carbonate is of no value. Potassium bitartrate and sodium sulphate have no antidotal value. Stannous chloride has little antidotal value. Calcium sulphite is probably too toxic to be of use as an antidote. Sodium phosphite alone has no antidotal value, but mixed in a certain proportion with sodium acetate it has antidotal efficiency. Sodium hypophosphite mixed with a certain proportion of sodium acetate or of hydrogen peroxide is also highly efficacious as an antidote. As the result of his studies, Fautus recommends the following antidotal treatment for mercuric chloride poisoning: Immediate administration of a tablet composed of sodium phosphite, 0.36 gm., and sodium acetate, 0.24 gm. If this be not available, give the following: Sodium hypophosphite, 1.00 gm., water 10.00 c.c. and hydrogen peroxide, 5.00 c.c. If the amount of the poison taken be known, ten times as much of the hypophosphite should be given as poison was taken. As this might require a large and possibly harmful amount of hypophosphite, it should immediately be followed by copious lavage, with a very dilute solution of the antidote. This may be followed by a safe dose of the antidote, which is to be retained, and which might be repeated every eight hours for several days. This antidotal treatment might be combined with some such eliminant treatment as recommended by Lambert and Patterson.

The Ultimate Results in the Treatment by Artificial Pneumothorax.—SHOETLE (*Jour. Am. Med. Assn.*, 1916, lxvii, 1268) reports 104 cases of pulmonary tuberculosis treated by artificial pneumothorax. The

ment in the spinal fluid findings. To thirty patients were given three or more double (Swift-Ellis) treatments, and marked improvement followed in each case. Thirteen patients who were previously incapacitated were restored to working capacity; of eighteen with ataxia, eight were relieved, five were markedly improved and five more were much improved. Seventy-five patients showed improvement in the spinal fluid Wassermann reaction; in ten cases this amounted to from 0.3 c.c. to 0.5 c.c., and in five other cases the reaction became negative with 1 c.c. The spinal fluid cell count became five or less in twenty-five cases. In four cases a period of two years has elapsed since treatment without any return of symptoms, in three others a period of eighteen months and in eight others six months or more. Four patients have shown some form of relapse. One with tabes had a relapse in ataxia, two with general paresis of the insane had a temporary relapse in mentality, while one with cerebrospinal syphilis developed a weakness in the legs probably of cerebral origin. Seventeen patients were treated intraspinally with salvarsanized serum alone, and all were markedly improved or relieved symptomatically. Nine who were previously unable to work were restored to working capacity. Of the seven patients with ataxia, four previously unable to work at all, became able to work, and in the other three, in whom the ataxia was not so marked there was great improvement. The Wassermann reaction in the spinal fluid became negative with 1 c.c. or 2 c.c. in eight cases, and in five others it was improved from 0.3 c.c. to 0.5 c.c. The spinal fluid cell count became normal in nearly every case. Two patients with syphilitic meningitis were relieved in every way. Seven patients have been observed twelve months since treatment was stopped, and four others for six months or more, and they show no return of symptoms. One patient with cerebrospinal syphilis had a return of headache after eight months, and two with tabes had a slight relapse in ataxia, which rapidly cleared up immediately following a treatment. In one patient a provocative Wassermann reaction occurred in the spinal fluid following the administration of salvarsan and in two cases a provocative reaction occurred in the spinal fluid following intraspinal treatment. Two patients with repeatedly negative reactions in the serum while under intraspinal treatment developed a positive reaction in the serum about the time the spinal fluid reaction became negative with 1 c.c. Improvement in symptoms following treatment seemed to parallel fairly closely the drop in the cell count, and those patients with high cell count seemed to improve symptomatically more rapidly and the cell count dropped more rapidly than occurred in those cases with low cell count. The only physical sign which was changed in these cases was that a positive Romberg in one case became negative. More benefit seemed to follow moderate after-treatment reactions than when no reaction occurred. Severe reactions are undesirable and may be avoided by less frequent treatments. In this series of cases no fatal or disturbing results followed treatment. In this series of cases the total number of cells in the spinal fluid did not vary as a rule. In a few cases of tabes, during severe crises of pain, and in cases immediately following too frequent and too large intraspinal injections of salvarsanized serum, the cell count temporarily increased. In their conclusions the authors state that patients with recent syphilitic meningitis and cerebrospinal

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first of this series of cases began treatment in May, 1912, the last in August, 1914. Seventy-five of these cases are to be eliminated as they proved inoperable, and are of interest only in showing that almost one case out of four had such extensive adhesion that operation was impossible. This leaves 79 cases that allowed of sufficient collapse to produce therapeutic effects. Of the seventy-nine patients, thirty-five are dead, two were apparently made worse; eighteen were improved, and twenty-one were discharged and treatment stopped as being symptomatically cured. Twelve of the eighteen marked "improved" are still under treatment. Of the twenty-one patients discharged as symptom fell, nineteen were third stage, two were second stage cases, seventeen were progressive and four were stationary. Sputum was positive in all. All were febrile cases and all had tried the usual rest cure and climate treatment. The majority were sanatorium cases and all had failed. These patients have now been without pneumothorax treatment for the following periods: two over three years; four over two years; five over one and one-half years; six over one year, and four for six months or over. Two have relapsed and died. Of the remaining nineteen, fifteen are well and working, and three others were when last the author heard of them; one is now ready for employment. Shoetle believes that the treatment is best carried out in an institution where proper after-care can be given. He also advises small injections of gas, never exceeding 500 c.c., and as a rule from 250 to 350 c.c.

Exophthalmic Goitre.—Ochsner (*Ann. Surg.*, 1916, lxiv, 385) in speaking of the treatment of exophthalmic goitre following operation states that with the exception of a very small number of cases in which an insufficient amount of the gland had been primarily removed, or in which the remnant which had been left at the primary operation had increased in size, and which have had a recurrence of symptoms, he has almost invariably found that they had either disregarded the directions given regarding diet and rest and hygiene or they had been permitted to return to their homes without definite instructions in this direction. He believes that it is very important that written or printed directions be given these patients and that they be thoroughly impressed with the importance of following these directions. The rules as formulated by Ochsner are as follows: Avoid all excitement or irritation of every description. An abundance of rest is important, and should be obtained by going to bed early and taking a nap after luncheon. Have an abundance of fresh air at night. Eat and drink nothing that irritates the nervous system such as tea, coffee, or alcohol. Do not use tobacco. Eat very little meat. If very fond of meat, take a little beef, mutton or breast of chicken or fresh fish once or twice a week or at least three times a week. Drink a great deal of milk and eat food prepared with milk such as milk toast, milk soups, etc. Cream and buttermilk are especially good. Avoid any kind of meat broths. Eat an abundance of fresh fruit and cooked vegetables, or very ripe raw fruits, or drink fruit juices prepared from ripe fruit. Eat plenty of eggs, bread, butter, toast, rice and cereals. Drink an abundance of good drinking water, or if this is not available, boil the drinking water or drink distilled water.

OBSTETRICS

UNDER THE CHARGE OF

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Puerperal Gangrene of the Extremities.—STEIN (*Surg., Gynec. and Obst.*, October, 1916) contributes an interesting paper upon this subject in which he cites reported cases and contributes two. His first case was that of a woman, aged twenty years, in apparently good general health. She was about three months pregnant. The pelvic organs were apparently normal, and it was suspected that the patient had become infected. Shortly after admission to the hospital a three months' abortion occurred with foul odor from the fetus and from the vagina. The next day the temperature became normal, but in the evening rose to 105° F. During the next six days the patient's temperature varied from 104° to 105° without pain and other symptoms. On the seventh day examination showed numerous grayish-white superficial ulcers around the cervix covered with whitish membrane. Some placental tissue was removed by a curette and the interior of the uterus was swabbed with tincture of iodin. This was repeated for the next seven days. The temperature remained between 101° and 102° F. Seven days after the curetting the patient complained of pain in the right leg and three days later the right leg and foot became cold and swollen with bluish discoloration. The foot was extremely painful to touch and the pulsation of the dorsalis pedis artery could not be felt. The whole foot became gangrenous. A line of demarcation formed and amputation had to be done below the knee. The heart remained normal. Several blood cultures showed no growth. The Wassermann test was negative. On examining the amputated tissue there was no thrombus in the anterior tibial or the dorsal artery of the foot. At the termination of the perineal artery there was a thrombus in the necrotic muscle and there were thrombi in the veins. In the literature this is the fourth case on record in which gangrene has followed abortion. In all of the other cases there was a vegetative endocarditis. The second case was one of labor at full term in a primipara, aged nineteen years, who was in good general condition. The Wassermann reaction was negative. Delivery was effected by a median application of the forceps and laceration repaired with chromic catgut suture. Two days afterward there was a slight chill with temperature of 104.5° F. There were ulcerations around the cervix and in the urine were found albumin and hyaline casts. The lacerated area sloughed and the tissues were removed. The patient's fever continued although the heart remained in good condition. Twelve days after confinement the patient insisted on leaving the hospital. She returned seven days later or nineteen days after confinement with a rigid abdomen, temperature 102° to 104° F., and pulse 110. Both feet were gangrenous about four inches above the ankles, and a line of demarcation gradually formed. There

was no pulsation in the femoral arteries. Blood cultures were negative. The patient's condition did not permit operation, and on her death no autopsy could be obtained. The writer believes that in the second case the thrombus from the uterus passed through the uterine artery and thence into the circulation to the bifurcation of the aorta and occluded both iliacs, thus causing gangrene on both sides. In the first case after abortion it is thought that the venous obstruction occurred first and that the artery became later occluded. The writer has collected cases from the literature of gangrene after childbirth, abortion, during pregnancy, and after gynecological operations. He adds a case contributed by Lilienthal, of New York. This patient, aged twenty-eight years, thirteen years previously had an abortion followed by septic infection. She had subsequently been operated upon for dysmenorrhea and four months before entering the hospital the appendix and right ovary had been removed and ventral suspension had been performed. An exploration of the upper abdomen was made at this time. Ten days after this operation there was sudden pain and tingling in the ends of the fingers of the left hand. Two days later dry gangrene of the fingers and end of the thumb developed. The patient had lost weight and when admitted to the hospital was in a much depressed condition. She had severe gastric symptoms, and there was stomatitis and vaginitis which gradually disappeared with cleanliness. All four fingers of the left hand were mummified. The urine was normal. There was no pulse in the left radial artery and none in the brachial until near the axillary, where feeble pulsations could be made out. The heart sounds were normal. Blood-pressure was 114 and 87. Under nitrous oxide and oxygen anesthesia the fingers were amputated and several spurting vessels had to be tied. No flap operation was made and the thumb was not operated upon. Wassermann test showed + + reaction. The patient grew steadily worse and the roentgen-ray showed obstruction in the upper part of the jejunum. Entero-enterostomy was performed and vomiting ceased. The patient gradually failed and died. There were no signs of peritonitis. At autopsy there was a patch the size of a quarter of a dollar in the aorta close to the ventricle, and adherent to this was an organized clot, part of which had undoubtedly broken off and clogged the brachial artery. On examination aortitis was present, and in view of the positive Wassermann findings syphilis suggested itself as the possible cause. In 53 of the cases the lower extremities were both affected 15 times; the left 16; the right 15. In 1 case both hands, both feet, the tip of the nose, and portions of the ears were gangrenous. In 2 cases there was gangrene of an arm and a leg. After abortion there were 3 cases of gangrene of the lower extremities and 1 in which both were affected. Gangrene in the upper extremities in puerperal cases is comparatively rare, as but 10 cases are reported. After gynecological operations but 5 cases were collected. These had all been abdominal sections. In most of the cases some lesion of the heart or vessels was present and very rarely a patent foramen ovale seemed to be the cause. Typhoid fever, pneumonia, and pleurisy preceded gangrene in some cases. Puerperal fever and obliterative endarteritis were present in 1 case and severe puerperal sepsis treated by abdominal hysterectomy was present in another. General septic infection occurred but rarely and pyemia but once. In 6 cases gangrene

complicated eclampsia and in 2 puerperal mania. Some of the cases occurred suddenly and without known cause, and there seemed to be no connection between the general health of the patient, the type of labor, and the occurrence of gangrene. So far as prevention is concerned, whatever brings the patient into good general condition at the time of labor is certainly indicated. Aseptic precautions for the patient and antiseptic precautions for doctors and nurses are imperative. At labor hemorrhage should be prevented and the circulation disturbed as little as possible during obstetrical operations. When the condition develops and the patient is sufficiently strong to endure the operation, amputation must be promptly performed.

Leukocytosis in Pregnancy, Labor, and the Puerperal Period.—Baer (*Surg., Gynec. and Obst.*, November, 1916) reviews the literature of the subject, and gives the results of their investigations illustrated by charts. They find that there is a leukocytosis of pregnancy appearing in the ninth month especially noticeable in primiparæ but slight in amount. In labor among primiparæ there is marked leukocytosis averaging 18,255, and this is increased when labor is prolonged beyond twenty-four hours. In a second labor it is less and in and after a third labor very greatly diminished. The height of the curve is reached on the first day of the puerperal period, after which there is a constant and rapid decline, until at the tenth day the curve is about normal. Lactation has little influence, nor has age excepting in young primiparæ who have a higher leukocytosis than older women. A differential study shows that the leukocytosis is caused chiefly by the polymorphonuclear neutrophiles, with a return to normal about the third day, and absence of eosinophiles in about half of labor cases and their reappearance on the first day of the puerperal period. Large and small lymphocytes, mast cells, and transitional types show no abnormality.

Cesarean Section through the Lower Uterine Segment.—Costa (*Semaine méd.*, 1916, xxii, 552) dates this method to Jorg, of Leipsic in 1807, and Osiander, Ritgen, in 1821 demonstrated the extraperitoneal method. In 1870 Thomas, of New York, published his paper on the subject. In 1907 there were before the profession seventeen distinct operations. The author divides these into extraperitoneal and transperitoneal. The first was founded on anatomic study, but the second arose from the fact that during the performance of an operation it was often impossible to make the operation an extraperitoneal one. Franck published his first 7 cases in 1904 and Selheim, Latzko and others have improved the method. Accidents are more numerous by the extraperitoneal route, and it is estimated that the peritoneum is opened in about 20 per cent. of cases. Next in frequency is injury to the bladder in 3 per cent. Fixation of the uterus to the abdominal scar has been observed, and this facilitates uteroflexion. Such adhesions are present in about 25 per cent. of the cases, but do not always cause dystocia in subsequent labor. Many believe that the principal indication for section through the lower segment is presence of infection, and when one remembers how readily the peritoneum is opened and communication thus established with the peritoneal cavity it becomes evident that in cases of infection this is not the safest method. Selheim treated 6

cases of placenta previa and Hinkel one without entering it. Most operators, however, believe that this method cannot compare with delivery through the vagina in appropriate cases nor with the classic Cesarean section. It is thought that conditions which contra-indicate the classic section, such as threatened rupture of the uterus, incomplete rupture of the lower segment, pulmonary tuberculosis, meningitis, and pelvic tumors, indicate the operation. The writer believes that after this operation the scar is better, and that there is less likelihood of rupture of the uterine scar in subsequent confinements than after the classic section. The best statistics of maternal mortality give 5.33 per cent., with an operative mortality ranging from 4.20 per cent. to 2.87 per cent. Postoperative complications occur in about 30 per cent. Fetal mortality varies from 1 to 3.62 per cent. Statistics would indicate that the section had an advantage of about 2 per cent. in mortality over the classic section, but many believe that this apparent advantage occurs because the classic section is performed with faulty technic.

Application of Anoci Association to Obstetrics.—HOAG (*Surg., Gynec. and Obst.*, November, 1916) believes that nitrous oxide and oxygen anesthesia is safe in labor and has obtained good results by using also limited amounts of scopolamin during the first stage. He injected novocain and quinine-urea into the perineum, and observed good results from this. He believes this combined method should be of value.

Perineal Anesthesia in Labor.—KING (*Surg., Gynec. and Obst.*, November, 1916) uses a 2 per cent. solution of novocain with $\frac{1}{3}$ minim 1 to 1000 solution adrenalin hydrochloride to each cubic centimeter. The site of injection was sprayed with ethyl chloride before the needle was introduced. The injection was made near the Colles fascia and in the ischiorectal region, midway between the anus and the tuberosity. The injections were made bilaterally, and in primiparæ only the anterior injections were employed. Multiparæ required both. There were no bad results in one hundred cases. Superficial necrosis of the inner portion of the labium occurred which cleared up without harm. The anesthetic was given in a few minutes and was prolonged for from two to four hours. Lacerations were diminished in number, hemorrhage was lessened, sterilization of the tissues was made more easy, and repair of injuries was greatly facilitated.

Retractions of the Uterine Muscle Associated with Obstructed Labor.—HICKS (*Brit. Med. Jour.*, October 14, 1916) describes the case of a primipara, aged thirty years, short in stature, who went into spontaneous labor. The fetal head remained high above the pelvic brim and freely movable, the head seemed half extended. The os gradually dilated, but was not filled by the presenting part. The attending physician applied the forceps, but traction failed to bring the head into the pelvic brim. A second application some time later also failed. On the next morning a third application of forceps was unsuccessful. The pelvic cavity was measured digitally, the sacropromontory was high up, the diagonal conjugate $4\frac{1}{4}$ inches, and a diagnosis was made of rachitic, flat, and generally contracted pelvis. On introducing the hand

a thick band of uterine muscle had formed around the neck of the child. The patient lived some distance from a hospital, and under deep chloroform anesthesia the attempt was made to pull the fetus through the contracted ring. The skull was perforated and traction made with the cephalotribe, with the result of wedging the whole mass more firmly into the pelvic brim. Accordingly, Cesarean section was done, the patient in a cyanotic and collapsed condition and dying on the following day. The writer draws attention to the danger of contracted pelvis where there is no apparent deformity to attract the attention of the physician. With regard to treatment, he states that if the practitioner thinks there is room enough, the fetal head being high above the brim and movable, the patient may be placed deeply under chloroform and morphin and the forceps applied. He believes that to apply the forceps to a fetal head movable and high above the brim is an obstetric operation requiring the most careful consideration, and should only be undertaken after careful examination of the condition of the uterine muscle around the neck of the fetus. If the examining hand can be passed easily beyond the shoulders of the fetus, an attempt to deliver with instruments can be made. If there is the least evidence that the uterine muscle is retracted around the neck of the fetus, Cesarean section should at once be performed. This is the old and familiar line of reasoning which continues to cause the death of mother and child. The application of the forceps to the unengaged and floating head is absolutely contra-indicated under all circumstances. With a pelvis of sufficient size and nearly normal proportions when the child is not large, podalic version is sometimes indicated. When attempts at delivery have already been made, craniotomy is to be chosen if the pelvis is sufficiently large to permit the extraction of the fetus after craniotomy is performed. If there is reason to believe that the uterus is infected, abdominal section followed by hysterectomy with the stump left outside the peritoneal cavity is indicated. No more dangerous mistake can be made in obstetric practice than the application of the forceps to the high and unengaged head.

The Scope and Limitations of Modern Obstetrics.—In the *Journal of the American Medical Association*, October 14, 1916, are published two papers, one by Davis and the second by De Lee, in which the former states the scope and limitations in modern obstetric surgery and urges that the general practitioner perfect himself in diagnosis and abstain from attempts to perform obstetric operations where the conditions are not favorable nor proper and without the necessary experience and appliances. Statistics are quoted which show that difficult delivery through the vagina by forceps or version and extraction has a higher mortality than elective section in clean cases. While in skilled hands delivery by abdominal section has a distinct and successful field, this is only possible in cases in which no previous efforts have been made at delivery and when complicated cases are referred at once to competent obstetricians. De Lee condemns unjust and unnecessary interference in labor. He cites the injuries produced by pituitrin, the indiscriminate employment of anesthetics of various sorts, the improper use of the forceps and the indiscriminate application of Cesarean section to improper cases. He urges the advantage of rectal examination for diagnosis during labor.

GYNECOLOGY

UNDER THE CHARGE OF

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Does Spontaneous Healing of Renal Tuberculosis Occur?—In view of the opinion held by practically all surgeons today that a tuberculous kidney should always be removed if the opposite organ is uninvolved and there are no positive contra-indications to operation, the possibility of non-operative cure is a question of very real importance. It is of course well known that a type of what may be called healing does occasionally occur by means of "autonephrectomy," the kidney being entirely destroyed as a functionating organ by being transformed into a mere shrivelled mass of fibrous tissue. A patient in whom this has occurred is therefore no better off, with regard to functional renal tissue, than one who has had a surgical nephrectomy, but has been exposed for a much longer time to the dangers of a chronic tuberculous focus in the body. A quite extensive investigation has recently been made by YOUNG (*Surg., Gynec. and Obst.*, 1916, xxiii, 395) to determine if there is any evidence on record to show that a definitely tuberculous focus in a kidney may undergo complete cure without total destruction of the kidney itself. By "cure" he means a complete destruction of the focus so that no living tubercle bacilli remain; he does not consider it enough that a caseous area be completely surrounded by a wall of fibrous tissue, however dense, so long as the centre is not completely organized, since it has been proved that as long as caseation exists the possibility of further infection remains. As proof of such a healing process taking place we can accept, he says, nothing less than operative or autopsy evidence of a characteristic organized tubercle or collection of tubercles taken from the kidney of an individual who showed during life tubercle bacilli and evidence of renal inflammation coming from that kidney. Apparent clinical cures, such as cessation of vesical irritability with disappearance of pus and demonstrable bacilli from the urine, cannot be accepted, as the possibility of long remissions with subsequent outbreaks in these cases is too well known. Practically all authors who have followed their cases long enough report trouble sooner or later, even after apparent cure for as much as eighteen years. The author has been unable to find after careful search a single case recorded in the literature that could be accepted as an instance of cured tuberculosis without complete destruction of the kidney, nor is he able to report one from the genito-urinary service of the Massachusetts General Hospital, thus thoroughly confirming the opinion that the only definite cure for renal tuberculosis is nephrectomy.

Oxygen in Cystography and Pyelography.—In an attempt to find some substance for casting a roentgen shadow of the bladder that would be less irritating than the silver preparations, GRANGER (*Am. Jour.*

Roentgenol., 1916, iii, 351) says that he hit upon the use of oxygen, and has been employing this gas with great satisfaction since 1909. It is well borne by the bladder, even in cases of cystitis and irritable bladder, and calculi are shown with remarkable clearness in organs distended in this manner. The entire outline of the bladder is distinctly visualized, and if the walls are unyielding from adhesions or infiltration this is easily seen; growths of the bladder, diverticula, and other deformities are also easily diagnosed. The technic is very simple. The bladder is emptied with a catheter, and a tube from the oxygen apparatus is then attached to the catheter. The bladder is distended slowly under a pressure of about one pound, until the patient feels that it is full, when the flow is interrupted for a few seconds, to be resumed at intervals until the intravesical pressure is about two pounds. The catheter is then removed and the picture taken. The author says that he has recently been trying the same method for pyelography, and reports two cases in which the results, though by no means perfect, give promise for the future after the technic shall have been further worked out. The chief points in using oxygen for the demonstration of the kidney pelvis are the correct preparation of the bowel so as to have it free from gas, and the determination of the exact amount of pressure to be used. It is important that the bladder should be kept under a slightly higher pressure than the renal pelvis, in order to prevent escape of the oxygen through the ureter.

The Pessary Treatment of Retroversion.—The choice of treatment for most retroversions has long been settled, as REYNOLDS (*Boston Med. and Surg. Jour.*, 1916, clxxv, 830) very justly points out, in favor of operation rather than the pessary. In the majority of cases the latter is merely palliative and not curative, and the prolonged use of the instrument is dangerous if not frequently removed and cleaned, and even if properly cared for it is in many ways more objectionable than any but the patients realize. As a rule the prolonged use of a pessary is worse than an operation, and is only tolerable when the latter is for some reason inadvisable. Moreover, the majority of retroversions are associated with inflammatory or other conditions which can be relieved only by operation. There is, however, one important class of patients in whom the author thinks great good can be accomplished by the use of pessaries, *i. e.*, those women in whom an uncomplicated retroversion occurs after childbirth in spite of a fairly intact pelvic floor, and in whom the uterus is freely replaceable. In these cases the vagina is usually capacious, the uterus somewhat heavy, and all the tissue relaxed. If these women are left alone after labor, the muscular structures which support the uterus, and which undergo evolution and involution with it in pregnancy and the puerperium, will cease involution at a degree of length and relaxation which results in an absence of tension, *i. e.*, in a comfortable adjustment of tensions in whatever position the uterus may be. If this has been held in retroversion by its own weight and intra-abdominal pressure during involution, this is the position in which it will remain, and subsequent reposition will not cause further shortening and stiffening of the ligaments sufficient to hold it there, once their course of involution has ceased. All that is necessary to secure the necessary

puerperal involution of the supporting structures, however, is to arrange the puerperium so that they undergo *complete* involution while the uterus is held in the extreme forward position. Under these circumstances the supporting structures almost invariably shorten and resume firmness to a degree which will hold the uterus permanently in a normal position. To accomplish this, the author advises starting treatment at a period in the puerperium when the uterus is still too large to be capable of retroverting, *i. e.*, from the tenth to the fifteenth day. At this time the uterus should be thrown into strong anteversion bimanually, and a carefully fitted hard-rubber pessary made to hold it there. Such a pessary will usually be larger than a stock size, and may have to be specially procured. Very hot vaginal douches should then be administered twice daily under very little pressure, to avoid the danger of carrying anything into the uterus through the dilated cervix. In most cases involution will take place so rapidly under this treatment that within a week the first pessary will be too large and too highly curved, and should be replaced by a smaller one, which in turn will have to be replaced by a still smaller one in ten days to two weeks. The hot douches are continued until the uterus is nearly down to the normal size and firmness. The author says that he has found this method nearly always successful in the class of cases described. It must be applied carefully, however, and demands a reasonable degree of experience and skill in the use of pessaries.

Studies of the Menopause. — An attempt has been made by CULBERTSON (*Surg., Gynec. and Obst.*, 1916, xxiii, 667) to determine some of the factors which may underlie the subjective phenomena at times associated with the natural or artificial termination of the menstrual process. The author has based his observations on the experiences of others, as recorded in the literature, and on the careful study of about 30 cases from his own practice, choosing so far as possible only patients in whom gross lesions, such as tumors, inflammations, and other factors leading to excessive hemorrhage, were absent. Like all other investigators, he has found the subject exceedingly complex, but considers that it fundamentally resolves itself into a study of the interrelationships of the entire system of ductless glands. The withdrawal of the secretion of one or more of these will be followed by glandular discord, and this is what happens at the climacteric, due to cessation of the ovarian secretion. The varied series of pictures presented by different patients passing through this period are explained by the predominance or subjection of different units of this complex glandular system in individual cases. Thus many present pictures resembling hyperthyroidism, a few suggest myxedema, and in others a tendency is manifested toward acromegaly, to dystrophia adiposogenitalis, etc. The climacteric, then, is a monoglandular affair only in its etiology; in its manifestations it is polyglandular. As the ovary decreases in activity the thyroid may maintain its full power, or may decline to a greater or less degree, and even become definitely deficient also, thus resulting in a positive or relative hyperthyroidism or a hypothyroidism as the case may be. The hypophysis and adrenals may also show characteristic disfunction, variously modifying the clinical pictures. In some cases the pineal or parathyroids may enter into

the situation; in short, the menopause may present as many different aspects as there may be single glands, or combinations of glands, working together in harmony under the influence of the ovarian hormone, or out of harmony during its absence. One important factor is nearly always present, in the author's experience, in cases of subjective menopausal disturbances, but has attracted apparently little attention. This is increased blood-pressure, which was definitely present in all but 4 of his cases. While the arterial tension is elevated, it is unstable, rising and falling under relatively minor influences. It presents one other peculiarity, that the diastolic does not go so high proportionately as does the systolic, giving a characteristically irregular but universally increased pulse-pressure. This disproportion he noticed even in the 4 cases without hypertension. He believes that the increased tension is probably due to a functional overefficiency on the part of the pituitary and adrenal glands following cessation of the ovarian activity. If this be true it would be natural to expect that the administration of corpus luteum extract would neutralize the pressor substances and decrease tension. This in fact seems to be the case, and the author has had excellent results from the employment of corpus luteum in many instances. He uses only the extract obtained from ovaries of pregnant animals, believing this to be much more efficient than that from ovaries selected haphazard. He has found that the blood-pressure not only shows a consistent and gradual decrease, but the systolic and diastolic pressures tend to come into normal relation. Where metrorrhagia was present it ceased with the reduction of arterial pressure in all cases in which the uterus was normal. The author emphasizes the importance of frequent blood-pressure estimation in these cases, both as a means of measuring the degree of menopause disturbance and of controlling the therapy. An occasional reading is of no value for this purpose, but the tension should be determined at frequent intervals, preferably daily, until improvement is well under way.

HYGIENE AND PUBLIC HEALTH

UNDER THE CHARGE OF

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Artificial Purification of Oysters.—WELLS (*Public Health Reports*, July 14, 1916, Reprint No. 351) states that the problem of purification of polluted oysters is quite an important one as shell-fish, depending

largely for their food upon substances washed down by rivers, grow in bays and waters which in many cases receive the sewage from cities. From various investigations, it has been demonstrated that oysters are naturally cleansed when put in clean surroundings, and Phelps found that two days' sojourn in pure water was sufficient to cleanse the oysters. This fact was further demonstrated by the author by which he found that oysters inoculated with B. coli were cleansed in a few days, showing that the period necessary for purification was short enough to make the process economically reasonable. Studies of the physiology, feeding habits and digestive mechanism of the oyster showed that the food material progressed through the gastro-intestinal system and was eliminated within five hours. The successful treatment of public drinking water with a small amount of hypochlorite of lime, and the low cost of the same suggested its use for purifying oysters. A tank was filled with Chesapeake Bay water, and about forty oysters were suspended eighteen inches below the surface in iron wire baskets. The tank was inoculated with cultures of B. coli, and after the oysters had become thoroughly infected, samples were collected. The water was then disinfected with from 25 to 150 c.c. of a 10 per cent. suspension of commercial calcium hypochlorite. After six hours, a second dose was added to kill such bacteria as might have escaped the first treatment. In the quantitative estimation of the number of B. coli suitable dilutions of the material were inoculated into lactose bouillon. Fermentation of this medium with typical appearance when smeared on endo-plates was considered a positive test for the organism. The score of three separate tests on each sample of five oysters was used. The results of these tests at about 26° C. and with a definite amount of available chlorine added per million parts of water showed great purification within twenty-four hours and some change when tested after six hours. Most of the initial samples were grossly contaminated; after the action of the hypochlorite, all but one (which received only one treatment) had less than 10 B. coli per cubic centimeter. No change in the condition of the oysters could be detected nor did the disinfectant appear to interfere with the normal activity of the oysters or with their flavor. The author concludes with the statement that the experiments go to prove that oysters can be artificially purified by exposure for a short period to water containing calcium hypochlorite and that such a process is feasible and practical.

Hemolytic Streptococci Found in Milk.—The attention of workers has been directed to the pathogenic properties of streptococci found in milk because of the relation existing between the milk supply and epidemics of streptococcal sore throat. As far as is known all streptococci causing epidemics have been of the hemolytic type, causing on human blood agar a clear zone 1 to 3 mm. in diameter about the colony. Non-hemolytic or feebly hemolytic streptococci, such as Streptococcus lacticus, may cause mastitis in cows, but there is no evidence to prove that they are pathogenic for man. Davis (*Jour. Infect. Dis.*, August, 1916, xvii, No. 2) made a study of hemolyzing streptococci obtained under various conditions from samples of pasteurized and certified milk. The strains isolated were subjected to various tests and compared with human hemolytic streptococci; 328 specimens of bottled

milk were collected from nine different dairies. Human blood agar was used in making plates and the counts were made after incubation at 37° C. for forty-eight hours; 85 of these samples yielded streptococci of the strongly hemolytic variety and these were carefully studied as to their morphology and cultural characteristics. They were found to vary considerably in shape, arrangement, sugar fermentation, and in the characteristics of the hemolytic zone formed. They were found to be more resistant to heat than the human strains of streptococci. Most of the strains were relatively avirulent for rabbits and therefore throat epidemics are very virulent for rabbits. It was found that human hemolytic streptococci coming direct from human lesions or from the diseased udder of a cow are much more virulent for cow than the hemolytic milk strains or bovine types, and a study of the morphology and cultural characteristics of the human and bovine types helps to prove further the difference between these two types. There has been no definite evidence to prove that the hemolytic milk streptococci have any sanitary significance although, on the other hand, the data at hand are not sufficient to positively exclude the possibility of bovine streptococci attaining virulence for man. However, during the course of this investigation, the different strains were observed for a considerable time and under various conditions, but only very slight, if any, variations were noted.

The Correlation of Certain Reactions of Colon Bacilli and Like Organisms with Source.—Hutton (*Jour. Infect. Dis.*, 1916, xix, No. 4) studied forty-five members of the colon-aërogenes group of bacteria isolated from various sources: milk, human feces, rabbit feces, water, sewage, human urine, and from egg powder. Their fermentation powers with various carbohydrates, lactose, sorbite, raffinose, dextrin, dextrose, saccharose, dulcite, mannite, maltose, adonite, and inulin were tested and it was found that there is a better correlation between saccharose-fermentation and source than between saccharose-dulcite fermentation and source. The methyl-red and Voges-Proskauer reactions are related as all organisms alkaline to methyl red gave a positive Voges-Proskauer reaction and all organisms acid to methyl red gave a negative Voges-Proskauer reaction. Organisms that gave a positive Voges-Proskauer reaction were non-fecal in origin and therefore it seems that this and the methyl red reactions are of sanitary importance in determining colon organisms of fecal origin.

The Bacteriology of the Bubble Fountain. — Pettibone, Bogart and Clark (*Jour. Bacteriol.*, 1916, i, No. 5) found that during an epidemic of streptococcus tonsillitis in a woman's dormitory at the University of Wisconsin streptococci were present in the bubble fountains used in the building and in the water issuing from these fountains. The city water supplying these fountains is of excellent quality, obtained from deep wells in sandstone, and several examinations showed no evidence of streptococci, while smears from a Berkefeld filter, through which the city water flowed for one week, showed nothing. A survey of all the fountains of the University showed the presence of Gram-positive streptococci in 55.8 per cent. of these fountains—an almost pure culture being obtained from one. Tests were

performed on an experimental bubbler in the laboratory, which was of the ordinary continuous flow type, the bubble being fed through four perforations in the top of a cylinder which screws into the centre of a hollow metal bulb. When B. prodigiosus was introduced by a pipette or the moistened lips into such a fountain, organisms were found to remain in the column of water from two to one hundred and thirty-five minutes, depending partly on the height of the bubble. This was due to the fact that, of the organisms introduced, most of them are flushed off at once, but some remained "dancing" in the water of the column for varying periods of time. The authors recommend the use of a fountain with the tube at an angle of 50 degrees from the vertical to avoid the difficulties of the fountain with a vertical column. Plates made from this type of fountain never showed the presence of B. prodigiosus even when samples were taken immediately after cultures of it had been introduced.

Experimental Epidemiology in Tuberculosis.—A. DISTASO (*Jour., Infect. Dis.*, 1916, xix, No. 4) studied the epidemiology of tuberculosis and formed the following postulate: The longer a comcommunity of people has been in contact with tuberculosis virus the less mortality is to be found among the people constituting that community, though almost 90 per cent. of civilized people in postmortem examination present healed tuberculous lesions. The author says that in investigating the cause of this diminished mortality two questions arise: (1) whether the virus has become attenuated through passages, or (2) whether the persons concerned have acquired a resistance to the virus. In answering these questions the author considers these problems—how the tuberculosis process is spread, what are the probable channels of infection, and what are the conditions under which resistance or immunity are established. In a series of experiments, uninfected guinea-pigs were put in the cages with infected ones at regular intervals. After seventeen days of exposure 75 per cent. died and showed tuberculous lesions on postmortem examination. By a second experiment the author showed that the amount of the initial dose of tubercle bacilli does not materially affect infection by contact, that infection by contact in 100 per cent. of the cases is lethal, and that the conditions of infection are still active after one month and three days. Another series of experiments was undertaken to determine the period of infectivity of the virus. As a result of these, the author concludes that a cycle of infection through contact exists. There is a curve which is *nil* at the beginning, which rises to its highest point between the ninth and thirty-third days and which then goes down again. It would seem that "at the beginning of the process few tubercle bacilli are excreted, with which the new contact can easily deal, and acquire a kind of resistance which preserves the animal when the excretion is at its height; but as soon as the infection goes on and the microbes swarm in the body, massive doses are excreted." By this time the new contact is powerless to cope at once with this large quantity, and therefore the pathogenic process establishes itself. The author's experiment to find out whether guinea-pigs living for a long time in contact with tuberculous guinea-pigs acquire a state of immunity proved nothing, as the subcutaneous inoculation was too severe a test for

demonstrating immunity. As regards the channel of infection the author states that in contact cases of tuberculosis in guinea-pigs three hypotheses, namely, that infection occurs (1) through the mouth, (2) through the nose, or (3) through both. He believes that the channel of infection in guinea-pigs is through the nose, as his experiments show that very small doses given through the nose almost certainly produce pulmonary tuberculosis, whereas observation of habits of the guinea-pig show that infection through the mouth probably does not occur.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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The Cytology of the Exudate in the Early Stages of Experimental Pneumonia.—Evans (*Jour. Infect. Dis.*, 1916, xix, 440) publishes a brief report of an experimental study of the early cellular exudate in acute pneumonic infections. In classifying the cells, which is done according to their origin rather than by morphology, the writer makes use of the indophenol blue reaction, employed to demonstrate the presence of an oxydase ferment in the cell body. Rabbits were used in the experimental work. Pneumonia was induced by intratracheal injections of broth cultures of pneumococci of Groups I and IV and two types of streptococci. The pneumococcus infection gave the gross appearance of lobar pneumonia better than did the streptococci. The lesions were examined after intervals of from eight to thirty-six hours following injection. Tissue from three autopsies on human cases of pneumococcal pneumonia, in which death had occurred at the third, fourth and fifth days respectively, was also available. The fact that the cytology of the exudate in the human cases was quite like that of the experimentally induced exudates is notable and indicates with what success such experimental work may be carried on. The cytology was also practically the same in all the experimental preparations. The cellular elements of the exudate were largely mononuclear although alveoli in which polymorphonuclear cells largely predominated were sometimes found. A few small lymphocytes were always present. A few very large mononuclear cells which were readily classified as epithelial cells also appeared frequently. In addition to these, two other types of large mononuclear cells were present in about equal

numbers. These two types were best differentiated by the indophenol blue reaction for the presence of oxydase ferment. The type showing the presence of the ferment strongly suggested the transitional mononuclear leukocyte (Naegeli), although some resembled myelocytes. The other cells, without oxydase ferment, were considered lymphoid in origin. Their resemblance to the so-called polyblasts (Maximow) is noted. The plates accompanying the article illustrate clearly that differentiation between the large mononuclear types without the use of the oxydase reaction would be quite impossible. Careful examination of a given field, before and after the oxydase reaction should make the distinction a fairly simple matter.

Spontaneous Amebic Dysentery in Monkeys.—EICHHORN and GALLAGHER (*Jour. Infect. Dis.*, xix, 395) report an epidemic of amebic dysentery in monkeys. The lesions found resembled in many respects those of human tropical dysentery. The animals were spider monkeys (ateles ater) from Central America. One animal when received from Columbia was ill with symptoms similar to those later manifested by the others. It was assumed that this animal carried the infection. Though the food and care which the animals received were of the best, their close association in the same cage and in addition a perverted appetite for their own excrement accounted for the transmission of the infection. The particular species of ameba dealt with was not determined. The organisms were seen both in the vegetative or ameboid forms, and in encysted forms. The former were most numerous in liver abscesses, though also seen in the intestinal contents where the encysted forms were in greatest numbers. It is pointed out that the encysted stage is usually obtained in the intestinal tract, and is a later stage of the life cycle of the organism. The liver abscesses showing the vegetative form were considered as more recent lesions. Transmission experiments were undertaken with cats, which have been successfully inoculated with the ameba histolytica, the cause of tropical dysentery in the human. These inoculations were, however, without result, although feces containing many encysted ameba were given in quantities that should have assured success. There is, however, good evidence that the ameba, since it was isolated from the intestinal canal in every case and from the liver abscesses, is an important etiological factor if not the only one in the cause of the disease. The early symptoms were lassitude, weakness, indifference and some loss of appetite. Emaciation was not marked. A severe diarrhea was the principal manifestation. The feces were fluid, yellowish gray and very offensive. They were blood stained in the more acute cases. The severe cases lasted only two or three days, while others lived for as many weeks after the onset of symptoms. Fifteen monkeys were exposed. Eight out of the fifteen died, and one of nine showing symptoms recovered. The protocols of the eight deaths are given individually In all, the cecum and colon were the seat of the most marked lesions. The rectum was involved to a variable extent. The lesions never passed the ileocecal valve. The mesenteric lymph nodes were sometimes enlarged and edematous. In two cases, liver abscesses were present. The mucosa of the large bowel was covered by a dense corrugated mass of grayish granular necrotic material. When less severe, there were isolated ulcers with raised, irregular congested

borders and gray, depressed, necrotic bases. The destruction of the mucosa occurred without fibrosis or cellular exudate in the deeper tissues, but when the submucosa was invaded, mononuclear leukocytes and a dense fibrous wall infiltrating the adjacent mucosa were characteristic. Amebas were found in the mucosa and in the necrotic tissue surrounding the ulcers. The liver abscesses were multiple in one case, while in the other but a single abscess was seen. The abscesses were without a fibrous wall, except where they approached the capsule of the liver. The borders of the abscesses were surrounded by a zone containing small, irregular necrotic areas. The abscesses burrowed deeply, and spread out within the interior of the lobes. Their interior was a mesh-work of liver-structure in all stages of disintegration. They contained a grayish white fluid pus, in which many amebas showing protoplasmic movement were seen. The authors suggest the possibility of transmission to the human as well as to laboratory animals of amebic dysentery, both by frankly sick monkeys and by others acting as carriers without, at the same time, showing any evidence of disease.

The Bacteriology of the Urine in Lobar Pneumonia.—In a short paper, accompanied by a concise and interesting chart, MATHERS (*Jour. Infect. Dis.*, xix, 416) reported the result of cultures made from catheterized specimens of urine obtained from cases of pneumonia in various stages of the disease. The research of Fraenkel and Rieche on pneumococcus in the kidney, in which they reported the finding of pneumococci in 22 out of 26 cases studied, is cited. In beginning the work, the questions as to whether pneumococci were commonly found in the urine of pneumonia patients, and whether, if found, the organisms had suffered any change during their passage through the kidney, were especially considered. After obtaining the specimen aseptically, a small portion, after centrifugalization, was examined both unstained and in stained smear for casts, leukocytes, bacteria, and other pathological elements. Cultures were made by plating the sediment from 10 c.c. of urine on human blood agar. These plates were then incubated at 37° C. for twenty-four hours. By cultural methods, pneumococci were isolated from the urine in 10 out of 26 cases. Gram-positive diplococci were seen in smears from the sediment in 18 of the 26 cases. These were doubtless other types of cocci, as staphylococci were frequently found, or possibly they represent dead pneumococci. The latter is possible, since urine is a poor medium for the growth of pneumococci. The organisms were all identified by the use of specific sera in addition to the usual differential reactions. Of the ten strains found, five belonged to Group I, three to Group II, and two to Group IV. Pneumococci were isolated from the blood and sputum of the cases studied; these corresponded in all the major characteristics to those obtained from the urine of the same case. Minor morphological differences, considered insignificant by the author, were found between the pneumococci from blood, sputum and urine in a given case. As to other organisms, two streptococci, one hemolytic and one of the viridans group were isolated; staphylococci and diphtheroid bacilli were found in several instances. The period immediately before or after the crisis was the most favorable one for the isolation of pneumococci from the urine. The writer concludes that during a

pneumococcic infection in the respiratory tract, pneumococci may be excreted in the urine. They appear to bear no definite relation to other pathological elements in the sediment; the strains isolated from the urine are in all essentials like those found in the blood and sputum. Hence, the deduction is made that urinary cultures may be of great value in the diagnosis of pneumonia, and of pneumococcic infections generally.

Antibody Productions by Typhoid Vaccines.—STONER (*Jour. Immunol.*, 1916, i, 511) attempts to solve the problem concerning the value of the different kinds of typhoid vaccine. He shows by a review of the literature that the experimental results of different writers do not agree as to the efficiency of the different vaccines. Not only does the production of (1) agglutinins, (2) opsonins, (3) bacteriolysins, and (4) precipitins vary in individuals or animals inoculated with these differently prepared vaccines, but also the results obtained by various experimenters. Stoner used for his experiments three types of vaccine. The first was the usual emulsion of twenty-four-hour agar cultures in saline and killed by heat. The second was prepared in a similar manner, save that before inactivation the bacteria were treated with antityphoid immune serum for three hours at 37.5° C. and then for twenty-four hours in the refrigerator. The third was prepared and treated with serum in a similar way to the second; then the organisms were killed with absolute alcohol, washed, dried *in vacuo* over sulphuric acid, and then ground in a mortar and emulsified in saline. These three vaccines were used to immunize both rabbits and humans. Sera of all cases were tested, after immunization, for agglutinins, opsonins, and bacteriolysins. It was found in both humans and animals that the first, or non-sensitized, vaccine stimulated a much more potent agglutinating serum. The opsonins and bacteriolysins, however, were slightly more marked after the use of either of the other two vaccines. Considering these results, and in view of the fact that experiments by Bull have proved the agglutination to be an important factor in the immunity, the author concludes that the sensitized vaccines are in no way superior to the non-sensitized. He states that though our knowledge of the mechanism of typhoid immunity is very scant, and that even after the disappearance of the demonstrable immune substances a potential immunity is still present to a certain degree, we still must give some weight to the presence of these substances in the blood. Thus on account of these substances and from lack of other evidence to prove the greater efficiency of the newer types of vaccine the author recommends the non-sensitized vaccine in all cases.

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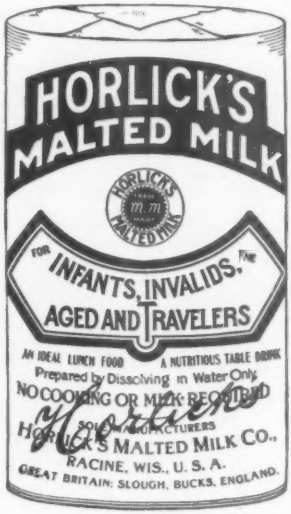

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